STATE OF MISSISSIPPI
PHIL BRYANT
GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
GARY C. RIKARD, EXECUTIVE DIRECTOR

May 28, 2015

Ms. Beverly H. Banister, Director
Air, Pesticides and Toxics Management Division
U.S. Environmental Protection Agency, Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960

In a letter dated July 16, 2014, the Region 4 office of the U.S. Environmental Protection Agency (US EPA) submitted comments regarding modeling performed for Mississippi Silicon LLC (MS Silicon), a new silicon manufacturing facility located near Burnsville, Mississippi in Tishomingo County. The Mississippi Department of Environmental Quality (MDEQ) responded to EPA Region 4 comments in a correspondence to you dated September 4, 2014. The September 4th comments were supplemented with a comprehensive confirmatory modeling report to further support the response to EPA's comments and demonstrate that the MS Silicon facility will not cause or contribute to a modeled exceedance of the National Ambient Air Quality Standard (NAAQS) for nitrogen dioxide (NO_2) and sulfur dioxide (SO_2). The ambient air quality modeling report was prepared in accordance with 40 CFR Part 51, Appendix W - Revisions to the Guideline on Air Quality Models, EPA Memos, and discussions with US EPA Region 4 modeling personnel.

In a conference call with Stan Krivo, of your staff, on Friday, May 22, 2015, Mr. Krivo commented MDEQ's September 4th responses to comments and subsequent comprehensive confirmatory modeling analyses were satisfactory. However, EPA Region 4's original comments, Comments 1, 2, and 3, were not fully resolved. The remaining issues are non-major. If left unaddressed, the issues will be considered unresolved or remaining concerns. EPA Region 4's original comments are restated in bold type followed by MDEQ's response in italics.

1. **Exclusion of Fugitive and Volume Emission Sources**

   According to the November 22, 2013, "Addendum #2 Updated Air Quality Impact Evaluation (Criteria Air Pollutants)," MS Silicon eliminated fugitive emission and volume source emissions because it concluded that their maximum impacts will be close to or within the facilities property boundary. To allow assessment of the appropriateness of this elimination, please provide supporting quantitative information on the number, location, and magnitude of the emissions excluded from the cumulative air quality assessment (e.g., inventory of the eliminated fugitive and volume sources).

Partially Addressed

- MDEQ's will include fugitive and volume emissions for all nearby emission sources located within the significant impact area (SIA). The modeled emission inventory will also include minor emission sources within the SIA.
- The requested information on the number, location, and magnitude of these emissions excluded from the cumulative air quality assessment (e.g., inventory of eliminated fugitive and volume sources) was not addressed.

MDEQ Response: *In the confirmatory modeling conducted by MDEQ, sources were screened by applying the 20D rule. If the source was not eliminated by the 20D rule, all of the emissions from that source were included in the model. Sources located within the significant impact area were included in the analysis regardless of the 20D comparison.* ***There were no fugitive sources eliminated.***

The modeling parameters for SO_2 Competing Sources and the NOx Off-Site Inventory were summarized in Table 5 and Table 6 of the Modeling Report, respectively.

2. **Use of Actual Emissions**

The MS Silicon modeling used allowable emissions except for the modeling relating to compliance with the one hour sulfur dioxide (SO_2) National Ambient Air Quality Standards (NAAQS) and the one hour nitrogen dioxide (NO_2) NAAQS in the November 2013 Addendum #2, where actual emissions were used. The use of actual emissions in the cumulative NAAQS compliance modeling is not supported by past or current practice nor by 40 CFR Part 51, Appendix W. Please provide a detailed technical explanation why this modelling approach is appropriate and in accordance with the current regulations, guidance, and accepted practice.

Partially Addressed

- All emissions to be used in the new impact assessment will be permit allowable or maximum potential emissions for each emission unit. No actual emissions will be used in this modeling effort.
- Modeled 1-hourly emissions developed from emission records containing only annual TPY values needs to be addressed. Modeled hourly emission rates developed from annual TPY values are generally not appropriate maximum allowable or potential hourly emissions.

MDEQ Response: *The modeling domain for the project extended into Tennessee and Alabama; therefore, the competing source inventory was comprised of sources from three (3) states. Ms Silicon developed the modeling inventory from the source lists provided. MDEQ reviewed the modeling inventory for accuracy and how the appropriate emission rates were developed. Current MDEQ emission data reporting procedure do not require sources to report maximum hourly usage or activity rates; therefore, the maximum 1-hour emission rates were estimated using the pound/hour emission limit established in an existing permit or EPA emission factor information detailed in "AP-42, Fifth Edition, Compilation of Air Pollution Emission Factors."*

3. **Modeled Receptor Grid**

Please confirm that all modeled controlling concentrations and/or concentrations exceeding ambient standards, and concentrations challenging these concentrations (e.g., greater than 90% of the values), have been modeled with 100-meter grid resolution. If this was not the case, please provide information showing the actual grid resolution and explain why this grid resolution is appropriate. Also, please provide and explanation of why the 100-meter grid resolution was not used and discuss any potential differences in outcome from the use of a different grid.

Partially Addressed

- The new MDEQ modeling will include significant impact level (SIL) assessment that will be performed with the receptor grids used for the impact modeling provided in the PSD permit application. MDEQ will select receptors where the MS Silicon project impacts equal or exceed 90% of the applicable SIL for the cumulative NAAQS compliance assessment.
- All cumulative compliance modeled receptors with concentrations equal or greater than 90% of the applicable NAAQS will be modeled with a receptor grid of 100-m resolution. Re-modeling with more refined receptor grids will be performed, as necessary.

MDEQ Response: *The SO_2 receptor grid was 100-meter spacing in all areas of predicted exceedances with the exception of the area that lies between TVA Colbert and MS Silicon. 100-meter spacing was added in this area, however, the additional receptors did not close out the entire area. Because the area is between MS Silicon and TVA Colbert, the two facilities cannot be impacting this area at the same time. Because MS Silicon doesn't impact the area at the times of predicted exceedances, expanding the grid further would not have resulted in any increase in the value of predicted contributions from MS Silicon.*

The initial NO_2 grid was expanded with 100-meter spacing at receptors where predicted exceedances occurred out to ½ the distance of the receptor spacing at the predicted exceedance. This method was chosen because of the computer resource demand due to a large area of predicted impacts from existing sources. While this method did not result in coverage with at least one receptor at 100-meter spacing beyond every predicted exceedance, the coverage was sufficient to determine that the maximum contribution from MS Silicon would be below the significant impact level. As stated in Appendix W, "In designing a receptor network, the emphasis should be placed on receptor resolution and location, not total number of receptors. The selection of receptor sites should be a case-by-case determination taking into consideration the topography, the climatology, monitor sites, and the results of the initial screening procedure." The MDEQ contends that the receptor network used meets Appendix W guidelines.

The confirmatory modeling analysis was complete and successfully demonstrated the MS Silicon facility/project would not cause or contribute to a modeled exceedance of the NAAQS for SO_2 or NO_2.

Thank you for the opportunity to resolve any remaining issues and/or clarify our response. If you have any other questions, please contact me at (601) 961-5073.

Sincerely,

Harry M. Wilson III, P.E., DEE, Chief
Environmental Permits Division
Mississippi Department of Environmental Quality

Cc: Dallas Baker, Director, MDEQ/Air Division
Stanley Krivo, USEPA/Region 4/Air, Pesticides, & Toxics/Modeling

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

JUN 2 2 2015

Ms. Becky Nester
Environmental Permits Division
Mississippi Department of Environmental Quality
Office of Pollution Control
P.O. Box 2261
Jackson, Mississippi 39225

Dear Ms. Nester:

Thank you for the opportunity to review the confirmational Modeling Report prepared by FC&E Engineering, LLC for the Mississippi Department of Environmental Quality (MDEQ). This confirmational information, which was provided to the U.S. Environmental Protection Agency on March 19, 2015, addressed the anticipated ambient air impacts from the proposed new Mississippi Silicon LLC (MS Silicon) manufacturing facility. MDEQ prepared this information after discussions with the EPA and in order to address questions which the EPA raised regarding their 2014 permit decision. Finally, MDEQ provided the EPA with a letter dated May 28, 2015, which further clarified the information submitted in March 2015.

After review of the March 2015 confirmational Modeling Report and subsequent May 2015 letter, we believe that the MDEQ modeling was performed following current regulatory guidance (*i.e.*, 40 CFR 51, Appendix W) and accepted modeling procedure and practices. The EPA believes the totality of information we have reviewed provides an adequate demonstration that the project's emissions will not cause or contribute to any modeled Sulfur Dioxide or Nitrogen Dioxide 1-hour National Ambient Air Quality Standards exceedance.

If you have any questions about these comments or require additional information, please contact me at (404) 562-9077 or Heather Ceron, Chief of the Air Permitting Section, at (404) 562-9185.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics Management Division

cc: Harry Wilson, MDEQ

STATE OF MISSISSIPPI
PHIL BRYANT
GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TRUDY D. FISHER, EXECUTIVE DIRECTOR

December 16, 2013

AIR PLANNING
DEC
PLEASE FREEDOM OF
EPA-REGION #4
ATLANTA, GA

Ms. Heather M. Ceron, Chief
Air Permits Section
U.S. EPA, Region 4
Atlanta Federal Center
61 Forsyth Street SW
Atlanta, Georgia 30303-3104

Re: Mississippi Silicon LLC
Tishomingo County, Air Ref. No. 2640-00060
Response to Comments on the Issuance of PSD Construction Permit

Dear Ms. Ceron:

Thank you for submitting timely comments on MDEQ's PSD Permit to Construct for the project referenced above. I have reviewed the comments and made changes to both the PSD Construction Permit and the Final Determination document, which incorporates the Preliminary Determination, as a result of your comments. Please find enclosed Mississippi's Silicon's response to your comments, which they have labeled Attachment A and Attachment B. Attachment A is Mississippi Silicon's Response to the comments raised on the PSD Construction Permit and BACT analyses. Attachment B is Mississippi Silicon's response to the comments raised on the Air Quality Analysis. Mississippi Silicon has provided a thorough response to these comments and in an effort to not misconstrue this information, the MDEQ is including the response comments as an attachment to this letter which we feel you will find acceptable.

At this time the MDEQ would like to bring to your attention the changes that we have either incorporated in the PSD Construction Permit or were the responsibility of the MDEQ to address during the public notice process specifically. Those changes are those which were noted in your comment letter dated November 14, 2013 and were Comments 3, 6, and 7.

Comment 3 is in reference to the Opacity exiting the control device and subsequently the roof vents of the facility since the NSPS for EAFs (i.e., NSPS Subpart AAa has a 3% exiting control devices and 6% roof vents versus the NSPS Subpart Z-Ferroalloy Production which is 15%) is more stringent and can be met should be achievable in this case.

Response 3 is that the facility and MDEQ is in agreement and a change to the PSD Construction Permit has been made whereby the Opacity exiting the control device for

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the SAFs is 3%, roof vents from the silicon production is 6%, and facility wide (including dust handling) is 10%.

Comment 6 is in reference to Startup, Shutdown, and Malfunction Emissions from the Facility and the request that the permit state that SSM emissions be included in evaluating compliance.

Response 6 is that Startup and Shutdown emissions have already been accounted for in the individual emission limitation for the facility including the BACT emission limitations. The Continuous Emissions Monitoring System (CEM) and Performance Testing will validate the potential emissions when these events occur also. Malfunction emissions, however are those emissions that wouldn't normally occur because of unforeseen instances and are not part of any routine method of operation and are defined by Mississippi Code. These things have been accounted for in the Permit.

Comment 7 is in reference to consultation with other states due to the potential to impact the air quality of Tennessee and Alabama.

Response to Comment 7 is that Mississippi does public notice the affected states in the same manner as the general public and has verified that this was done in a timely manner and carried out accordingly.

Should you have any additional questions or need further information, please feel free to contact me at (601) 961-5784. Again, we appreciate your comments and timeliness.

Sincerely,

Bonnie Morgan

Bonnie Morgan
Metal and Metal Fabricators Branch
Environmental Permits Division

Enclosures (2)

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Attachment A
Proposed Mississippi Silicon LLC Project
Tishomingo County, MS
Follow-Up Response –Comments Raised by EPA Region IV
November 22, 2013

Provided below are responses to comments raised by the EPA Region IV as it pertains to the Mississippi Silicon LLC Project to be located in Tishomingo County, Mississippi. For ease of review we have provided the EPA Region IV comment followed by an appropriate response.

Question #1 - Best Available Control Technology (BACT) for GHGs: Reducing energy consumption will reduce greenhouse gas emissions. The identification of available control technologies (page 4-8) identifies post combustion of the flue gases and states this is not available for silicon metal. It is not clear how this conclusion was reached. We believe that post combustion of the flue gases is both available and technically infeasible for this facility. There appears to be ample waste heat and CO available that could be used to pre-heat the ladle or the incoming charge. Alternatively, if direct use of the waste energy is impractical, the flue gas could be used to generate electricity. Further, we note that other facilities with EAFs have successfully installed off-gas waste heat recovery systems. The flue gas characteristics of the MS Silicon facility have not been demonstrated to be so different from many similar operations (e.g., steel mills and smelting operations) to simply rely on the claim that it has not been proven in silicon plants to dismiss it as technically infeasible. In addition, the permit application includes a reference to energy recovery as being part of a typical Silicon Manufacturing facility. (See Figure 2-2b, General Process Diagram - Typical Silicon Manufacturing Process, includes energy recovery in the diagram with a footnote that the energy recovery was not considered for the proposed facility). Thus, it appears that this measure should be considered technically feasible and alternative energy recovery options should be further evaluated for economic feasibility under the BACT analysis.

RESPONSE #1:

While recovery from clean gaseous streams in the steel industry is common, heavily contaminated exhaust gases from coke ovens, blast furnaces, basic oxygen furnaces, and electric arc furnaces continue to present a challenge for economic waste heat recovery. Heat recovery techniques from these dirty gaseous streams are available, yet implementation has been limited due to high capital investment costs[1].

Capturing and reusing the heat generated from the Submerged Arc Furnaces (SAF) for the ladle operation is considered technically and economically infeasible for the following reasons:

- Several physical limitations (space / distance) from the SAF to the ladles will not allow heat to be captured from the SAF and then transferred to the location of the ladle operations.
- The ladle operation also involves a mechanical crane which restricts any additional equipment in and around the ladle areas.

[1] Waste Heat Recovery: Technology and Opportunities in U.S. Industry, BCS Incorporated, March 2008

- The heat input of the ladle preheaters is 10 MMBtu/hour each thus the small amount of natural gas combusted does not justify the capital costs of a heat recovery system.

Some of the other common approaches to waste heat recovery from exhaust gases include:

- Combustion air preheating - Not applicable at Mississippi Silicon (used only as building utilities)
- Load or charge preheating - This has been applied to drying and preheating of ores; however, quartz is not amenable to preheating and heat retention. Drying of the carbon sources is not recommended due to potential combustion or explosion hazards.

In general, key restrictions preventing heat recovery in a particular application can include cost, temperature restrictions, chemical composition of heat streams, application specific constraints, and difficulty accessing and transporting non-fluid heat sources. Challenges for heat recovery under these constraints include material costs, maintenance costs, lack of a local end use for low temperature heat, environmental concerns, and the need for process and product quality control[2].

Regarding the use of the flue gas to generate electricity by utilizing the chemical energy in the off-gas the following limitations are noted. While technically feasible, installation and operation of either a turbine/generator system to produce electricity or a boiler system for steam production is cost excessive in light of the current electricity costs available to MS Silicon in Mississippi.

A number of factors in addition to the temperature of the waste heat must be considered to determine the economic feasibility of power generation from waste heat sources[3]. The total cost to install a waste heat system includes the costs associated with the waste heat recovery equipment (boiler or evaporator), the power generation equipment, power conditioning and interconnection equipment. It would also include the soft costs associated with designing, permitting and constructing the system.

A first-cut estimate of the cost of producing power from this type of system is presented in Table 1. Representative costs are shown that represent a range of project sizes (<400 kW to > 5 MW) and site complexity. Capital costs are amortized over a 10 year period based on a cost of capital of 15 percent and 7,500 annual operating hours. Operation and maintenance (O&M) cost estimates can also vary widely.

Table 1 - Waste Heat to Power (WHP) Cost Comparison[3]

Cost Component	
Installed Costs, $/kW	$2,000 - $4,000
WHP Generating Costs	
Amortized Capital, $/kWh	$0.055 - $0.125
O&M Costs, $/kWh	$0.005 - $0.020
Total Power Cost, $/kWh	**$0.060 - $0.125**

***Source:** ICF International estimates, 2012*

[2] Waste Heat Recovery: Technology and Opportunities in U.S. Industry, BCS Incorporated, March 2008

[3] EPA (U.S. Environmental Protection Agency). 2007b. EPA Combined Heat and Power Partnership (CHPP). Catalog of CHP Technologies. Available at http://www.epa.gov/chp/basic/catalog.html.

Based on the above information, power costs for a WHP system range from $0.060 to 0.125 per kWh. MS Silicon has a power supply contract that will provide electricity at a delivered cost below the low end of the range of $0.06/kWh, thus this difference in electricity costs is considered cost excessive for this project.

MS Silicon will continually review waste heat recovery systems and as newer technologies emerge, will evaluate their economic and technical feasibility. The plant will be designed with physical space for future waste heat recovery opportunities.

Question #2 - BACT for Particulate Matter - Opacity: EPA previously noted that that the application contains insufficient explanation of the opacity limits for the facility as a whole and on the baghouse on the submerged EAF. EPA suggested consideration of opacity limits for particulates that exit from a control device of 3 percent opacity or less, and particulates that exit from the plant, due solely to the operations of any affected EAF, of 6 percent opacity or less and a prohibition on from the dust handling system of any gases of 10 percent opacity or less. In their response to our comments, the applicant agreed that these limits are acceptable. However, the new opacity limits do not appear to be in the preliminary determination's BACT analysis (section III) or the summary of permit limitations (section V). We continue to believe these recommended limits are appropriate and should be included in the permit.

RESPONSE #2 – MS Silicon believes that these limits are acceptable and should be included in the permit.

Question #3 - BACT for SO_2: We believe that a more robust analysis of BACT alternatives is necessary to support the permit record. If built as proposed (4 units), the facility is projected to emit over 2,000 tons of SO_2 and the air quality modeling indicates that the facility will violate the NAAQS for SO_2. Incorporating temporary limits in the PSD permit that restricts operation to two of four proposed submerged EAFs is not an acceptable alternative to identifying the appropriate SO_2 control technology and requiring its operation in the PSD permit. In addition, the analysis does not make it clear why variable emission rates result in technologies such as Spray Dry Adsorption and Dry Sorbent Injection technically infeasible. We would expect that these technologies are technically feasible since limestone is already used in the process as a flux and sorbent flow rates can be adjusted as emission rates change. There are other industrial processes with variable emission rates that control SO_2. In addition, there are a host of sulfur removal options besides those identified in the preliminary determination, as well as viable fuel based alternatives such as low sulfur coal or greater reliance on wood, that are not affected by the variability of the emission rate. In short, there are technically feasible options for the control of SO_2 that we recommend be considered in the BACT analysis.

RESPONSE #3 -

The volumetric exhaust gas flow rate from one SAF baghouse is approximately 81,500 scf/minute. When coupled with the relatively low SO_2 emission rates, a relatively small SO_2 concentration is in the exhaust. - Based on engineering estimates, the concentration of SO_2 in the offgas is about 90 ppm. This is much

lower than the concentration typically found for flue gas desulfurization systems such as wet and dry scrubbers[4]. The SO_2 concentration will also vary widely over the SAFs cycle.

The Spray Dry Adsorption (SDA) control alternative has the following significant limitations for effective technical applicability for SAF applications:

(i) The low SO_2 concentration in the influent coupled with a relatively large gas flow would retard the adequate contact interface with the reagent;

(ii) The variations in the SO_2 concentration during and between heats would severely impair the control system's capability to respond adequately. SDA systems are not designed for adept load-follow flexibility; and

(iii) The low temperature of the exhaust gas of around 350 °F and the low gas moisture would not allow sufficient thermal gradient for an appropriate approach to saturation which typically specifies that the temperature of the desulfurized gas stream leaving the spray dryer be around 30 – 50 °F above its dew point;

Thus, SDA dry scrubbing option is considered technically infeasible for this application.

The Dry Sorbent Injection (DSI) control option typically involves the injection of dry powders into either the furnace or post-furnace region of utility-sized boilers. This process was developed as a lower cost option to conventional FGD technology. Since the sorbent is injected directly into the exhaust gas stream, the mixing offered by the dry scrubber tower is not realized. The maximum efficiency realized for this SO_2 control technology is estimated to be fairly nominal. It is felt that if sufficient amounts of reactants are introduced into the flue gas, there is a possibility of some degree of mixing and reaction. The science is inexact and the coupling of reactant dosage and in-flue mixing which impacts the SO_2 control efficiency is susceptible to variability in SO_2 concentrations.

This control alternative has the following significant limitations for effective technical applicability for SAF application:

(i) The low SO_2 concentration in the influent coupled with a relatively large gas flow would retard the adequate contact interface with the reagent;

(ii) The variations in the SO_2 concentration during and between heats would severely impair the control system's capability to respond adequately. DSI systems are not designed for adept load-follow flexibility and variable reactant dose control with fast response times comparable to anticipated process conditions; and

(iii) Due to the anomalies of mixing afforded by the process, the reaction kinetics are not very flexible and rather time-dependent. Unlike the SDA system, the mixing uncertainty can potentially reduce DSI technology to a sheer brute-force proposition resulting in unstable and unpredictable performance;

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[4] Air Pollution Control Technology Fact Sheet, EPA-452/F-03-034

Question # 5 - Startup, Shutdown and Malfunction (SSM) emissions: There is no discussion on how SSM emissions are to be treated from this facility. We recommend that the permit state that SSM emissions are to be included in evaluating compliance.

RESPONSE #5 –MS Silicon does not foresee any significant changes in emissions of regulated air pollutants during startup and shutdown events of the proposed submerged arc furnace. MS Silicon will develop, prior to operation of the submerged arc furnaces, startup, shutdown and malfunction operation plans to ensure excess emissions do not occur during these events. The draft permit requires the installation and operation of continuous emission monitors for NOx, CO and SO_2 and thus will be able to demonstrate compliance with the emission limitations established by the MDEQ as well as those emissions that would occur during startup and shutdown events. MS Silicon will take appropriate actions to minimize excessive emissions during malfunction events.

Attachment B
Proposed Mississippi Silicon LLC Project
Tishomingo County, MS
Follow-Up Response –Comments Raised by EPA Region IV – Air Quality Impact Evaluation
November 22, 2013

Provided below are responses to comments raised by the EPA Region IV as it pertains to the Mississippi Silicon LLC Project to be located in Tishomingo County, Mississippi. The comments raised by EPA Region IV pertained to the air quality impact evaluation that was performed in support of the PSD air permitting process.

For ease of review, we have provided the EPA Region IV comment followed by an appropriate response.

Question #1 – Significant Impact Area – Contradictory modeling information that affects the impact assessments has not been resolved (e.g., significant impact areas are indicated to be contained within Tishomingo County while MDEQ's Preliminary Determination indicates otherwise).

Response #1:

The Significant Impact Areas (SIA) for each regulated air pollutant subject to PSD review for the MS Silicon plant project was provided in Table 2-4. Refer to Table 2-4 attached to this attachment that defines the SIA for each regulated air pollutant and corresponding averaging period. The extent of the SIA was based on the proposed operation of four (4) SAF units associated with the proposed plant. Based on operation of the four (4) SAF units, the SIA was shown not to extend into Tennessee or Alabama for PM_{10}. The SIA for $PM_{2.5}$ was also shown to not impact Tennessee and Alabama. The SIA areas for the SO_2 3-hour, 24-hour and annual averaging periods were also shown not to extend into Tennessee and Alabama. The NO_2 annual averaging period did not extend into Tennessee or Alabama. The initial SIA's for SO_2 and NO_2 1-hour averaging periods were predicted to extend into Tennessee and Alabama based on operation of four (4) SAF Units. Operation of two (2) SAF units did reduce the overall extent of these SIA's, however the area still extends into portions of Tennessee and Alabama. Refer to Figures 3-5a and 3-6a that provide a visual representation of the areas affected in Tennessee and Alabama. Since the figures do not identify the overall extent of the SIA, refer to Figures 3-5f and 3-6c which identifies the receptor placement with the significant impact areas.

Question #2 – SO2 Impacts Sipsey Wilderness Area: The project impacts to the Sipsey Wilderness PSD Class I area are greater than the SO_2 SIL. These significant impacts generally indicate the need to perform a cumulative PSD Class I area increment assessment or a sufficient demonstration why the cumulative PSD Class I area increment assessment is not needed. This should be reconciled in the permit record before a permit is issued.

Response #2 – Included as an attachment is a copy of the executive summary from the technical report provided to the MDEQ and the Federal Land Manager. As shown in this document, the only item of discussion is that the proposed plant will have predicted impacts of SO_2 emissions that will be above the significant impact levels for the 3-hour and 24-hour averaging period. However, the predicted concentrations are slightly above the SILs. The predicted concentrations from the proposed plant are shown to be 1.0 ug/m^3 for the Class I 3-hour increment which is only 4% of the Class I increment of 25 ug/m^3. Predicted concentrations for the 24-hour period were 0.2 ug/m^3 which also only represents 4% of

the Class I increment of 5 ug/m^3. ***MS Silicon is not aware of any other SO_2 sources in the area (considered to be Class I Increment consuming) that when combined with the potential impacts from the MS Silicon plant would cause an exceedance of the Class I increments at Sipsey Wilderness Area.***

It is important to note that EPA Region IV did make a request that the chemical transformation algorithm should be turned off in Calpuff and the model reran. The model was reran and the results obtained did not alter the discussion / nor the conclusion discussed above. A copy of that updated analysis is also attached.

Since the percentage of the Class I increment to be consumed at the Sipsey Wilderness Area is extremely low (<4%) based on potential emissions from the MS Silicon plant, inclusions of other potential SO_2 existing sources (that would consume increment) in the Class I analysis would not drastically affect or alter the outcome of that analysis. The probability of other existing increment consuming sources having predicted Class I increment concentrations at or above 96% of the Class I SIL would be extremely low. MS Silicon did request a listing of other SO_2 increment consuming sources that should be included in the Class I analysis. All three agencies; MDEQ, Federal Land Manager and EPA Region IV were not aware of any other SO_2 increment consuming sources that should be included in that analysis. Consequently, MS Silicon has concluded that the Class I analysis is complete and that no further evaluation is required. The Federal Land Manager has also formally accepted the analysis with no stipulations for further evaluations to be conducted.

Question #3 – NAAQS Compliance Modeling does not provide sufficient information and analyses – The PSD Class II area National Ambient Air Quality Standards (NAAQS) compliance modeling and documentation does not provide sufficient information and analyses to support the statement that the project will not cause or contribute to the modeled NAAQS exceedance.

Response #3 – MS Silicon has provided an air quality impact evaluation discussion in the initial PSD air permit application dated August 15, 2013 and Addendum #1 document dated October 10, 2013. As presented in those documents, air quality impacts resulting from the proposed MS Silicon plant project were shown to be below the NAAQS for each regulated air pollutant subject to PSD review. After initial review by EPA Region IV and MDEQ, further analysis was requested to ensure that the proposed MS Silicon plant project would not contribute to predicted exceedance of the SO_2 and NO_2 1-hour NAAQS. EPA Region IV also requested clarification of some of the supporting information that was used to support the modeling analysis. Two separate letters were sent to the MDEQ answering specific questions raised by MDEQ and EPA Region IV and were dated October 2nd an 23rd, respectively. At the request of the MDEQ, MS Silicon was asked to assemble all of the information presented in the initial application, Addendum #1 and two follow-up letters. MDEQ also requested that additional modeling be performed to further support that the MS Silicon plant project would not cause or contribute to a predicted exceedance of the NAAQS. To satisfy MDEQ's request, a stand alone document was prepared, herein referred to as Addendum #2 which was provided to the MDEQ via email on November 22, 2013.

The intent of Addendum #2 is to provide one overall document that contains the analysis contained in: a) the PSD application, b) the additional analysis provided in Addendum #1, and c) to consolidate the responses provided in the two response letters noted above. This document provides the entire air quality impact evaluation as it pertains to the air quality impact requirement for regulated air pollutants subject to PSD review. Also included in this document is an analysis that demonstrates that emissions of

VOC and NO_x from the proposed plant will not significantly impact or alter the ozone concentration levels currently existing in the area of the proposed plant site as measured by ambient monitoring conducted by the MDEQ.

As demonstrated in that document, the proposed MS Silicon plant will result in predicted ambient air quality impacts that meet the PSD Class II increments, as well as the NAAQS for each air pollutant subject to PSD review. The following approach was utilized as summarized below:

- ***Step 1*** – Potential emissions from each source of air pollution from the proposed plant were modeled using an EPA approved air dispersion model. This included emissions of PM_{10}, $PM_{2.5}$, NO_x, SO_2, CO and VOCs (i.e., ozone conversion only) which were subject to PSD review. Emissions from the plant were reflective of four (4) submerged arc furnaces (SAFs) operating simultaneously. MS Silicon is proposing to construct the plant in two phases, with two SAFs being associated with each phase. The predicted concentrations from modeling all four SAFs meet the Class II increments and NAAQS for each regulated air pollutant listed above.

- ***Step 2*** – Using the predicted concentrations obtained from Step 1, the plant's area of significant impact was defined using the significant impact level (SIL) concentration thresholds. The purpose of defining the area of significant impact is to define what existing air emission sources should also be evaluated in conjunction with the proposed MS Silicon emission sources. This is referred to as the multi-source impact analysis and is used to demonstrate that the MS Silicon plant's proposed emission sources will not cause or contribute to an exceedance of the NAAQS.

During this step, it was determined that several existing sources were shown to have predicted concentrations that exceeded the SO_2 and NO_2 1-hour NAAQS. Because of these predicted exceedances, several additional modeling analyses were performed to demonstrate that the proposed plant's air emission sources would not contribute to a predicted exceedance of those 1-hour NAAQS. This analysis was required to demonstrate that the plant's air emission sources would result in predicted concentrations on those predicted exceedance receptors below the significant impact levels established for SO_2 and NO_2 1-hour concentrations. In order to demonstrate that the proposed MS Silicon plant's air emissions would not exceed the significant impact levels on those receptors predicted to exceed the 1-hour NAAQS, MS Silicon restricted the operation of the four (4) SAFs to no more than two (2) SAFs operating simultaneously.

The air quality impact evaluation performed during Step 1 and Step 2 was reflective of four (4) SAF units operating simultaneously. Because the predicted concentrations (i.e., PM_{10}, $PM_{2.5}$, CO) were shown to be in compliance with the PSD Class II increment and NAAQS, the evaluation was not redone to reflect operation of two (2) SAF units. This is conservative and reflects a worst case modeled predicted concentration. The PSD Class II increment for SO_2 and NO_2 were also based on operation of four (4) SAF units. Thus, the only modeling analysis that was reflective of operation of two (SAF) units was the SO_2 and NO_2 1-hour NAAQS. There are no Class II increments associated with SO_2 and NO_2 for a 1-hour averaging period.

As discussed in the initial PSD air permit application, the proposed MS Silicon plant project triggered PSD review for emissions of PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2 and VOCs. It is therefore necessary to demonstrate that the potential emissions of these regulated air pollutants will not: 1) result in predicted air quality impacts that would be harmful to human health and welfare (referred to as the NAAQS compliance

demonstration), and 2) will not result in predicted concentrations that would limit industrial growth in the area (referred to as the PSD Class II increment analysis). Information provided in Addendum #2 provides technical information to support that the proposed emission sources from the MS Silicon plant project will meet the two PSD review requirements noted above.

An ozone air quality impact analysis is also required under PSD review if VOC or NO_x emissions from the proposed plant are more than 100 tons/year. Since NO_x emissions (emissions of VOC were slightly below 100 tons/year) from the proposed plant will be above 100 tons/year, an air quality impact evaluation was performed to demonstrate that the combined emissions of VOC and NO_x would not cause or contribute to a violation of the ozone NAAQS. The analysis performed and the results obtained from that analysis are provided in Section 4.5 of Addendum #2. As shown in that section, the proposed project will have an insignificant impact on ozone air quality and will not cause or contribute to an exceedance of the ozone NAAQS.

Section 4.5 of Addendum #2 provides the analysis performed, including the results obtained from that analysis to demonstrate the proposed plant's emissions of regulated air pollutants will not adversely impact local soils and vegetation. A Class I impact analysis was also performed which demonstrated that the proposed plant's emissions of regulated air pollutant would: a) not affect visibility, b) not exceed Class I increment standards, and c) will not cause deposition at the Sipsey Wilderness Area located in Alabama. The analysis performed and results from that analysis were submitted to the MDEQ and the Federal Land Manager under separate cover. The Federal Land Manager has approved the analysis that was performed and has concluded that the proposed MS Silicon plant will not adversely impact the Sipsey Wilderness Area. As a point of note, the analysis performed was reflective of operation of two (2) SAFs.

Provided below is a summary of the predicted concentrations obtained from the multisource air quality impact evaluation. These predicted concentrations were obtained following EPA modeling procedures and reflect worst case impacts based on operation of two (2) SAF units associated with the proposed plant project. Detailed modeling was performed, including multiple analyses to demonstrate that the proposed plant (based on operation of two (2) SAF units) will not cause or contribute to a predicted exceedance of the NAAQS. Refer to Addendum #2 for supporting technical information and modeled results.

- **Maximum Predicted Concentrations from PM_{10} NAAQS Analysis**

  As shown in Table 3-5 of Addendum #2, predicted PM_{10} concentrations are below the PM_{10} 24-hour NAAQS. The maximum predicted concentration listed below meets the PM_{10} NAAQS:

  - PM_{10}– 24-Hour – 66.48 ug/m^3 compared to the NAAQS of 150 ug/m^3.

- **Maximum Predicted Concentrations from $PM_{2.5}$ NAAQS Analysis**

  As shown in Table 3-5 of Addendum #2, predicted $PM_{2.5}$ concentrations are below the $PM_{2.5}$ 24-hour NAAQS. The maximum predicted concentration listed below meets the $PM_{2.5}$ NAAQS:

  - $PM_{2.5}$ – 24-Hour – 25.13 ug/m^3 compared to the NAAQS of 35 ug/m^3; and
  - $PM_{2.5}$ – Annual – 11.68 ug/m^3 compared to the NAAQS of 12 ug/m^3.

- **Maximum Predicted Concentrations from SO_2 NAAQS Analysis**

  As shown in Table 3-6b Addendum #2 predicted SO_2 concentrations are below the SO_2 NAAQS. The maximum predicted concentration listed below meets the SO_2 NAAQS:

  - SO_2 – 1-Hour – 137.99 ug/m^3 compared to the NAAQS of 196 ug/m^3;
  - SO_2 – 3-Hour – 115.38 ug/m^3 compared to the NAAQS of 1,300 ug/m^3;
  - SO_2 – 24-Hour – 34.94 ug/m^3 compared to the NAAQS of 1365 ug/m^3; and
  - SO_2 – Annual – 8.36 ug/m^3 compared to the NAAQS of 80 ug/m^3.

- **Maximum Predicted Concentrations from NO_2 NAAQS Analysis**

  As shown in Table 3-7d and Table 3-8 in Addendum #2 predicted NO_x concentrations are below the NO_x annual and 1-hour NAAQS, respectively. The maximum predicted concentration listed below meets the NO_2 NAAQS:

  - NO_2 – Annual – 10.90 ug/m^3 compared to NAAQS of 100 ug/m^3; and
  - NO_2 – 1-Hour – 163.6 ug/m^3 compared to NAAQS of 188 ug/m^3.

It should also be noted that multiple model runs were made to demonstrate that the proposed MS Silicon plant project (operation of two (2) SAF units) would result in predicted concentrations that would be below the Class II Significant Impact Level on each occurrence of a predicted exceedance of the NO_2 1-hour NAAQS. The Maxcount option of AERMOD was also utilized to demonstrate the insignificant impact concentrations from the proposed plant on predicted exceedances of the 1-hour NO_2 NAAQS.

Question #4 – PSD Class II Compliance Modeling does not provide sufficient information and analyses – The PSD Class II area PSD increment compliance modeling and documentation also does not provide sufficient information and analyses to support the statement that the project will not cause or contribute to a PSD increment exceedance.

Response #4 – MS Silicon has provided an air quality impact evaluation discussion in the initial PSD air permit application dated August 15, 2013 and Addendum #1 document dated October 10, 2013. As presented in those documents, air quality impacts resulting from the proposed MS Silicon plant project were shown to be below the PSD Class II increments for each regulated air pollutant subject to PSD review. After initial review by EPA Region IV and MDEQ, further analysis was requested to ensure that the proposed MS Silicon plant project would not contribute to predicted exceedance of the Class II Increments.

At the request of the MDEQ, MS Silicon was asked to assemble all of the information presented in the initial application, Addendum #1 and two follow-up letters. To satisfy MDEQ request, a stand alone document was prepared, herein referred to as Addendum #2 which was provided to the MDEQ via email on November 22, 2013. As presented in that document the following information was provided on the PSD Class Increment analysis:

According to MDEQ modeling guidance, Tishomingo County's minor source baseline date has not been triggered for regulated air pollutants with established Class II increments. Since this is the first PSD permit in the county to result in predicted concentrations above the PSD significant impact levels for SO_2, NO_2, PM_{10} and $PM_{2.5}$, the PSD minor source baseline date will be triggered as part of this PSD permitting process.

The minor source baseline dates have already been triggered for the counties surrounding Tishomingo:

- Alcorn County – **NO_x** – 01/26/2005, **PM_{10}** – 01/26/2005, **SO_2** – 01/26/2005
- Prentiss County – **NO_x** – 10/22/2007 and **PM_{10}** – 10/22/2007.

The PSD Class II increments currently established by U.S. EPA are as follows:

- PM_{10} – 30 ug/m^3 24-hour averaging period and 17 ug/m^3 annual averaging period
- $PM_{2.5}$ - 9 ug/m^3 24-hour averaging period and 4 ug/m^3 annual averaging period
- NO_2 – 25 ug/m^3 annual averaging period
- SO_2 – 512 ug/m^3 3- hour averaging period, 91 ug/m^3 24-hour averaging period and 20 ug/m^3 annual averaging period.

The PM_{10}, $PM_{2.5}$, SO_2 and NO_2 PSD Class II increment compliance demonstrations did not require preparation of a multisource air modeling inventory because the MS Silicon project sources are the only PSD increment consuming source for these regulated air pollutants, being the first major source of these air pollutants to go through PSD review in the area since the increment was established. The results of the air dispersion modeling indicates that the MS Silicon plant will be in compliance with the PSD Class II increments

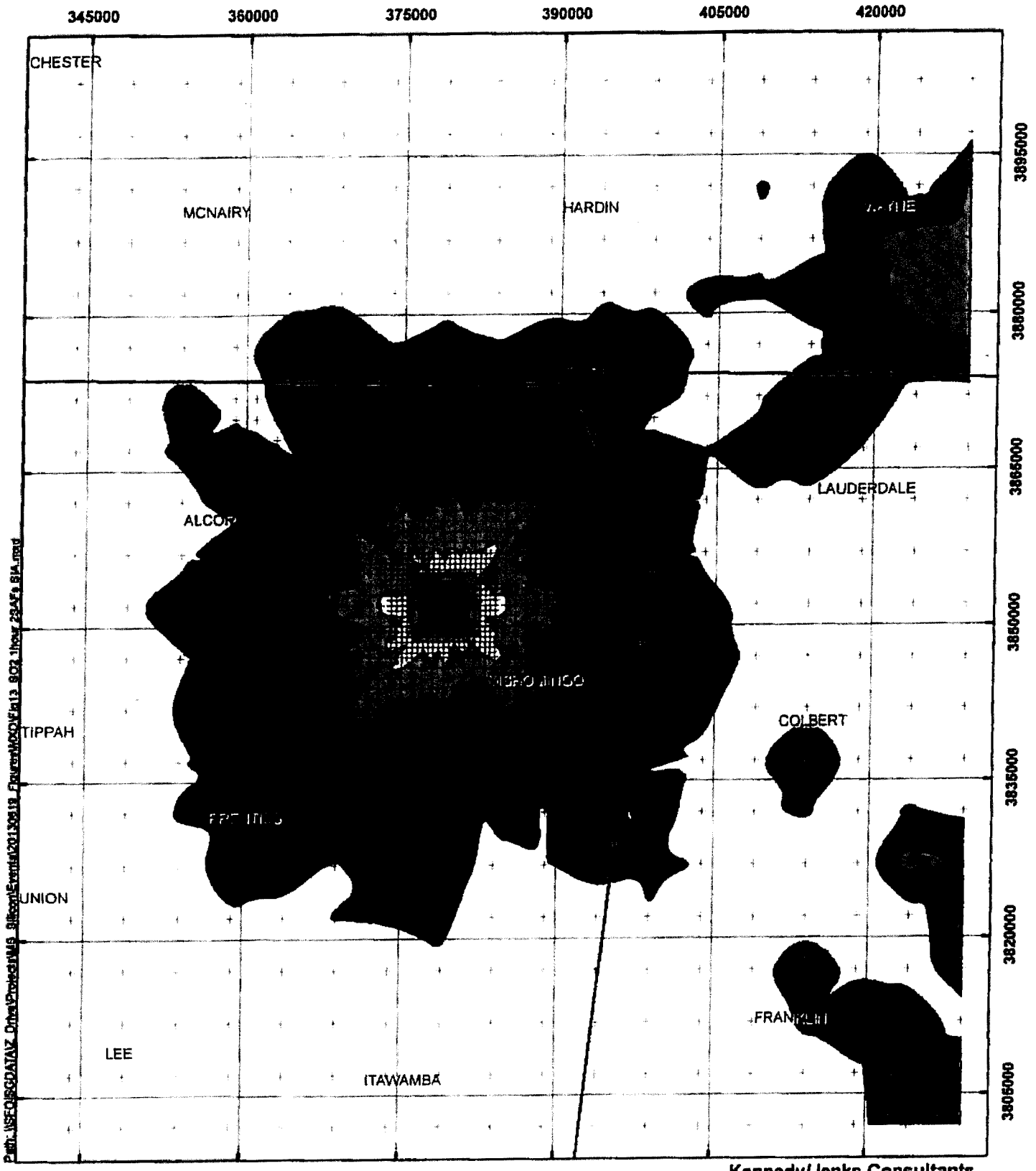
Since the significant impact areas for the proposed plant's emissions of PM_{10}, $PM_{2.5}$, NO_2 (annual averaging period) are within Tishomingo County, no impact on Class II increment consumption should occur in other counties in Mississippi, Tennessee or Alabama. The proposed project is the only identified source that will consume Class II increments. In the initial PSD Class II increment analysis for emissions of SO_2, it was determined that the SO_2 area of influence would extend into Alcorn County. Since the PSD minor source baseline date for SO_2 had already been defined, a demonstration of compliance with the SO_2 PSD Class II increment would have to include the proposed MS Silicon plant emission sources, as well as any other Class II increment consuming SO_2 existing sources. The MDEQ confirmed that the only other SO_2 Class II increment consuming source would be Kingsford Manufacturing Company located approximately 13 kilometers to the northeast of the proposed MS Silicon plant site in Alcorn County. Inclusion of this emission source in the modeling analysis, along with the MS Silicon SO_2 emission sources did not result in predicted SO_2 concentrations higher than that initially determined for the MS Silicon plant emission sources only. In short, this demonstrates that there are no interactions of the emission sources from these two plants that would cause an increase in the predicted concentration that is being used for comparison with the Class II increment standards.

The maximum PSD Class II increment consumption results are in the attached Table 2-5.

Table 2-4
MS Silicon LLC
Proposed Silicon Manufacturing Plant
Summary of Applicable Standards PSD Class II SILs Distances*

Air Pollutant	Averaging Period	Class II SIL	Distance (km)	Year	Statistical Form of Ambient Concentration (At Each Receptor)
PM_{10}	24-Hour	5	4	2007	Highest first high of the 5 years
	Annual	1	2	2007	Highest of the 5 years
$PM_{2.5}$	24-Hour	1.2	7	2008	Average of the highest from each year
	Annual	0.3	2.6	2011	Average of the highest from each year
NO_2	1-Hour	7.52	50	2007	Average of the highest maximum daily 1-hour concentration from the 5-year period
	Annual	1	6	2011	Highest of the 5 years
SO_2	1-Hour	7.8	50	2007	Average of the highest maximum daily 1-hour concentration from each year
	3-Hour	25	11	2009	Highest first high of the 5 years
CO	1-Hour	2000	--	--	Average of the highest from each year
	8-Hour	500	--	--	Average of the highest from each year

Notes:
*Based on operation of four (4) SAF units



Legend

SIL Area			
	30.0		Risk Receptors
7.8	50.0	—	Property Boundary
12.0	60.0		
20.0	66.0		

N

0 20,000 40,000

Scale: Feet

Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

SO_2 1-hour SIL Area
2 SAFs, 5 Year Average

K/J 1341008*00
November 2013
Figure 3-5a

Legend

Risk Receptors

PropBoundary

N

0 15,000 30,000

Scale: Feet

Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

SO2 1-hour Receptor Grid

K/J 1341008*00
November 2013

Figure 3-6f

STATE OF MISSISSIPPI
AIR POLLUTION CONTROL
PERMIT

AND PREVENTION OF SIGNIFICANT DETERIORATION AUTHORITY TO CONSTRUCT AIR EMISSIONS EQUIPMENT

THIS CERTIFIES THAT

[redacted]

Mississippi Silicon

Burnsville, Mississippi

Tishomingo County

has been granted permission to construct air emissions equipment to comply with emissions limitations, monitoring requirements, and other conditions set forth herein. This permit is issued in accordance with the provisions of the Mississippi Air and Water Pollution Control Law (Section 49-17-1 et seq. Mississippi Code of 1972), and the regulations and standards adopted and promulgated thereunder and under authority granted by the Environmental Protection Agency under 40 CFR 52.01 and 52.21.

MISSISSIPPI ENVIRONMENTAL QUALITY PERMIT BOARD

AUTHORIZED SIGNATURE
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

Issued: November 27, 2013 **Permit No.: 2640-00060**

PART I
GENERAL CONDITIONS

I.1. Any activities not identified in the application are not authorized by this permit.

I.2. All air pollution control facilities shall be designed and constructed such as to allow proper operation and maintenance of the facilities.

I.3. The necessary facilities shall be constructed so that solids removed in the course of control of air emissions may be disposed of in a manner such as to prevent the solids from becoming windborne and to prevent the materials from entering State waters without the proper environmental permits.

I.4. The air pollution control facilities shall be constructed such that diversion from or bypass of collection and control facilities is not needed except as provided for in Regulation APC-S-1, "Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants", Section 10.

I.5. The construction of facilities shall be performed in such a manner as to reduce both point source and fugitive dust emissions to a minimum.

I.6. The permittee shall allow the Mississippi Department of Environmental Quality Office of Pollution Control and the Mississippi Environmental Quality Permit Board and/or their representatives upon presentation of credentials:

a. To enter upon the permittee's premises where an air emission source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any air emissions.

I.7. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to:

a. Violation of any terms or conditions of this permit.

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts, or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of authorized air emissions.

I.8. Except for data determined to be confidential under the Mississippi Air & Water Pollution Control Law, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Mississippi Department of Environmental Quality Office of Pollution Control.

I.9. The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

I.10. Nothing herein contained shall be construed as releasing the permittee from any liability for damage to persons or property by reason of the installation, maintenance, or operation of the air cleaning facility, or from compliance with the applicable statutes of the State, or with local laws, regulations, or ordinances.

I.11. This permit may only be transferred upon approval of the Mississippi Environmental Quality Permit Board.

I.12. This permit is for air pollution control purposes only.

I.13. Approval to construct will expire should construction not begin within eighteen (18) months of the issuance of this permit, or should construction be suspended for eighteen (18) months.

I.14. The permittee shall notify the MDEQ in writing when construction of the facility begins within fifteen (15) days of beginning actual construction.

I.15 Upon the completion of construction or installation of an affected source, the permittee shall notify the Permit Board within thirty (30) days that construction or installation was performed in accordance with the approved plans and specifications on file with the permit board. Certification of Construction for the purposes of this permit is defined as completion of the commissioning and testing, of all of the major production lines, which allows the beginning of operations as an integrated facility.

I.16 The Permit to Construct shall be deemed to satisfy the requirement for a permit to operate until the date the application for issuance of the Title V Permit to Operate is due. The permittee shall submit an application for a Title V Permit to Operate no later than twelve (12) months after beginning operation. Beginning operation will be assumed to occur upon certification of construction, unless the permittee specifies differently in writing.

PART II
EMISSION POINT DESCRIPTION

The permittee is authorized to construct air emissions equipment for the emission of air contaminants from the Silicon Manufacturing Plant:

[illegible]	[illegible]
AA-000	Silicon Manufacturing Plant
AA-100	Raw Material Handling and Storage Operations
AA-101	Material Handling and Transfer to and from Coal Storage Pile
AA-101a	Conveyance of Coal to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-102	Material Handling and Transfer to and from Wood Storage Pile
AA-102a	Conveyance of Wood to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-102b	Wood Chipper
AA-103	Material Handling and Transfer to and from Quartz Storage Pile
AA-103a	Conveyance of Quartz to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-104	Material Handling and Transfer to and from Limestone Storage Pile
AA-105	Storage Piles Processing (i.e., Bulldozing)
AA-106	Wind Erosion on Coal, Wood and Quartz Storage Piles
AA-200	Silicon Manufacturing Plant

[illegible]	[illegible]
AA-201	Four (4) Submerged Arc Furnaces equipped with individual negative pressure Baghouses (BG1, BG2, BG3, and BG4) for controlling emissions from the maximum production capacity of 2.75 tons/hour per furnace and 11.0 tons/hour utilizing all four furnaces and 21,024 tons/year per furnace and 84,096 tons/year utilizing all four furnaces.
AA-201a	Casting Frames
AA-202	Four (4) 10.0 MMBTU/Hr Natural Gas-Fired Ladle Preheaters (2 ton ladle capacity)
[illegible]	[illegible]
AA-301	Silicon Grinding and Milling Operations equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG6)
[illegible]	[illegible]
AA-401	One (1) 500 gallon Diesel Storage Tank
AA-402	Plantwide Fugitive Emissions from Roadways
AA-402a	Plantwide Fugitive Emissions from Transport of Raw Materials (Material Storage Piles to SAF Charging Building)
AA-403	Slag Handling and Storage
AA-404	Silica Fume Silos
AA-405	Facility Wide Miscellaneous Operations subject to APC-S-6 *(Insignificant Activities)*
AA-500	Emergency Support Equipment
AA-501	One (1) 670 HP Diesel-Fired Emergency Generators

PART III
EMISSION POINT SPECIFIC LIMITATIONS AND STANDARDS

AA-000 *(Entire Facility)*	PSD Construction Permit Issued November 27, 2013	III.1	Silicon Production	84,096 tpy
		III.2	Natural Gas Combustion	350,000 MMBtu/yr
		III.3	NOx	1,906.2 tpy
		III.4	CO	1,444.3 tpy
		III.5	SO2	2,170.1 tpy
		III.6	VOC	93.5 tpy
		III.7	PM/PM10	81.8 tpy
		III.8	PM2.5	73.33 tpy
		III.9	HAP	9.90 tpy (Single)
				24.9 tpy (Combined)
AA-101 *(Coal Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier (where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.11	Material Throughput Rate	105,120 tpy
AA-101a (Coal Conveyance)	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-102 *(Wood Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.13	Material Throughput Rate	212,763 tpy

AA-102a (Wood Conveyance)	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-102b *(Wood Chipper)*	PSD Construction Permit Issued November 27, 2013	III.14	PM/PM10/ PM2.5	BACT: Operation with an enclosure that will minimize fugitive emissions and limited hours of operation
AA-103 *(Quartz Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.15	Material Throughput Rate	212,763 tpy
AA-103a (Quartz Conveyance)	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-104 *(Limestone Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.16	Material Throughput Rate	183 tpy
AA-105 *(Storage Piles Processing)*	PSD Construction Permit Issued November 27, 2013	III.17	PM/PM10/ PM2.5	BACT: Development of Dust Control Plan including measures to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required
AA-106 *(Storage Pile Wind Erosion)*	PSD Construction Permit Issued November 27, 2013	III.18	PM/PM10/ PM2.5	BACT: Implementation of a Fugitive Dust Control Plan. Visible emissions shall be controlled using water, dust suppressants, or wind screens as needed.

AA-200 *(Silicon Processing)*	PSD Construction Permit Issued November 27, 2013	III.28	Opacity	6% exiting roof vents
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued November 27, 2013	III.19	PM/PM10/ PM2.5	BACT: 0.005 gr/dscf and use of fabric filter control (i.e., baghouse)
	40 CFR 60.262(a)(1)	III.20	PM	0.99 lb/MW-hr (compliance with 40 CFR 60, Subpart Z)
	PSD Construction Permit Issued November 27, 2013	III.21	GHG (as CO2e)	BACT: 95,467 tpy of CO2e per furnace and 381,866 tpy of CO2e f for all Furnaces combined; Use of Semi-Enclosed Furnace; and Good Operation and Maintenance
		III.22	NOx	BACT: 45.0 lbs/ton (averaged over a 3-hr period) of Silicon produced
		III.23	CO	BACT: 34.0 lbs/ton (averaged over a 3-hr period) of Silicon produced; Good Combustion and Operating Practices; Use of Semi-Enclosed Furnace
	40 CFR 60.263(a)	III.24		Less than 20 volume percent on a dry basis
	PSD Construction Permit Issued November 27, 2013	III.25	SO2	BACT: 52.0 lbs/ton (averaged over a 3-hr period) of Silicon produced; and Utilization of Low Sulfur Content Material (where technically feasible)
		III.26	VOC	BACT: 2.4 lbs/ton (averaged over a 30-day period) of Silicon produced; and Good Operating Practices
	40 CFR 60.264(a)	III.27	Opacity	Continuous Opacity Monitoring (COM) Installation and Operation
	PSD Construction Permit Issued November 27, 2013	III.28		3% exiting from the control device (i.e., fabric filter) (since this limit is lower than the 15% emission limitation of 40 CFR 60.264(b) the permittee is in compliance with 4 Subpart Z)
	PSD Construction Permit Issued November 27, 2013	III.54	Operating Limit	Only Two out of the Four Furnaces may be operated at any given time.
		III.55		Requirements to Remove Operating Restrictions

AA-201a *(Casting Frames)*	PSD Construction Permit Issued November 27, 2013	III.29	PM/PM10/ PM2.5	BACT: Best Management Practices to minimize the generation of fugitive particulate emissions
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued November 27, 2013	III.30	NOx	BACT: 0.08 lbs/MMBTU; low NOx or equivalent burners/technology; combustion of clean fuel; and good combustion practices
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued November 27, 2013	III.31	GHG	BACT: 117 lb/MMBTU of CO2
				BACT: 0.0022lb/MMBtu of Methane;
				BACT: 0.0002 lb/MMBtu of N2O
				BACT: Good Combustion Practices, Combustion of Natural Gas Only, Periodic Maintenance, and energy efficient burner design including Low NOx burners or equivalent
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued November 27, 2013	III.32	PM/PM10/ PM2.5	BACT: 0.0076 lbs/MMBTU; Combustion of Natural Gas; and Good Combustion Practices
		III.33	CO	BACT: 0.0840 lbs/MMBTU; Combustion of Natural Gas; and Good Combustion Practices
		III.34	SO2	BACT: 0.0006 lbs/MMBtu; Combustion of Clean Fuel (i.e., Combustion of Natural Gas Only); and Good Combustion Practices
		III.35	VOC	BACT: 0.0055lb/MMBtu; Combustion of Natural Gas; and Good Operating Practices
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM control
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued November 27, 2013	III.17	PM/PM10/ PM2.5	BACT: Development of Dust Control Plan including measures to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required

AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued November 27, 2013	III.36	PM/PM10/ PM2.5	BACT: 0.01 gr/dscf for PM10/PM2.5 and the use of Bin Vent Filter for PM Control
AA-404 *(Silica Fume Silo)*	40 CFR 60.262(b) and PSD Construction Permit Issued November 27, 2013	III.37	Opacity	Dust Handling Equipment Emissions shall not exceed 10%
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued November 27, 2013	III.38	PM/PM10/ PM2.5	BACT: Good Combustion and Operating Practices and Compliance with NSPS IIII
			CO	
			VOC	
			NOx	BACT: Good Combustion and Operating Practices; Compliance with NSPS IIII; and Use of Ultra Low Sulfur Diesel (ULSD) fuel
			SO2	
	40 CFR 60.4200(a)(2)(i)	III39	NSPS Subpart IIII	Applicability
	40 CFR 60.4206	III.40		Lifetime Requirements
	40 CFR 60.4205(b)	III.41		Emission Standards
	40 CFR 60.4207(b)	III.42		Diesel Fuel Requirements
AA-000 *(Entire Facility) *where applicable*	40 CFR 64.2(a)	III.43	CAM	Applicability
	40 CFR 60.260	III.44	NSPS Subpart Z	Applicability
	40 CFR 63.11524(a) and (b)(2)	III.45	MACT Subpart YYYYYY	Applicability

AA-000 *(Entire Facility)* **where applicable*	40 CFR 63.11525(c)	III.46	MACT Subpart YYYYYY	Compliance Date (Upon Startup)
	40 CFR 63.11526	III.47		Emission Standards
	40 CFR 63.6585(a) and (c) via 63.6590(c)	III.48	MACT Subpart ZZZZ	Compliance via NSPS Subpart IIII
	PSD Construction Permit Issued November 27, 2013	III.49	Opacity	No more than 10%
AA-405 *(Insignificant Activities)* **where applicable*	APC-S-1, Section 3.4(a)(1)	III.50	PM/PM10	0.6 lbs/MMBTU or as otherwise limited by facility modification restrictions
	APC-S-1, Section 3.4(a)(2)	III.51		$E = 0.8808*I^{-0.1667}$ or as otherwise limited by facility modification restrictions.
	APC-S-1, Section 3.8(a)	III.52		0.2 grains/dscf of flue gas calculated to 12% CO_2 by volume
	APC-S-1, Section 4.1(a)	III.53	SO2	4.8 lbs/MMBTU per hour or as otherwise limited by facility modification restrictions
AA-000 (Entire Facility)	PSD Construction Permit Issued November 27, 2013	III.56	SSM	Provisions for Startup, Shutdown, and Malfunction Emissions

III.1 For Emission Point AA-000 (Entire Facility), the permittee shall limit the annual Silicon Production to no more than 84,096 tons per year (tpy) as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.2 For Emission Point AA-000 (Entire Facility), the permittee shall limit Natural Gas Combustion to no more than 350,000 MMBtu per year (MMBTU/yr) as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.3 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Nitrogen Oxides (NOx) to no more than 1,906.2 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.4 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Carbon Monoxide (CO) to no more than 1,444.3 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.5 For Emission Point AA-000 (Entire Faciltiy), the permittee shall limit emissions of Sulfur Dioxide (SO2) to no more than 2,170.1 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.6 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Volatile Organic Compounds (VOCs) to no more than 93.5 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.7 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Particulate Matter/Particulate-10 (PM/PM-10) to no more than 81.8 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.8 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Particulate Matter-2.5 to no more than 73.33 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.9 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Hazardous Air Pollutants (HAPs) to no more than 9.90 tpy for any single HAP and 24.9 tpy for combined HAPs, as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.10 For Emission Points AA-101, AA-102, AA-103, and AA-104 (Coal, Wood, Quartz, and Limestone Storage Pile Material Handling Areas), the permittee shall implement as appropriate the following Best Management Practices for minimizes PM emissions (BACT for PM/PM10/PM2.5);

(a) Install a 3-sided windscreen barrier (where technically feasible);
(b) Reduce drop heights;
(c) Use chemical stabilizers;

(d) Use watering Techniques; and
(e) Develop and Implement a Fugitive Dust Control Plan

(Ref.: PSD Construction Plan Issued Issuance Date)

III.11 For Emission Point AA-101 (Coal Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 105,120 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.12 For Emission Point AA-101a, AA-102a, AA-103a, AA-301, and AA-403 (Coal, Wood, and Quartz Conveyance, Silicon Grinding and Milling, and Slag Handling and Storage) the permittee shall limit PM/PM10/PM2.5 emissions to no more than 0.003 grains per dry standard cubic foot (gr/dscf) and use a baghouse for PM/PM10/PM2.5 control (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.13 For Emission Point AA-102 (Wood Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 212,763 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.14 For Emission Point AA-102b (Wood Chipper), the permittee shall operate with an enclosure that will minimize fugitive emissions and limit the hours of operations to minimize PM/PM10/PM2.5 emissions (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.15 For Emission Point AA-103 (Quartz Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 212,763 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.16 For Emission Point AA-104 (Limestone Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 183 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.17 For Emission Point AA-105 (Storage Piles Processing), the permittee shall implement a Dust Control Plan for minimizing PM/PM10/PM2.5 emissions (BACT for PM/PM10/PM2.5) which shall include as appropriate the following;

(a) Application of a wet suppressants;
(b) Watering Application;
(c) Spreed Reduction Implementation and Postings; and
(d) Vacuuming or Sweeping Methodologies

(Ref.: PSD Construction Plan Issued Issuance Date)

III.18 For Emission Point AA-106 (Storage Pile Wind Erosion), the permittee shall implement a Fugitive Dust Control Plan for minimizing PM/PM10/PM2.5 emissions (BACT for

PM/PM10/PM2.5) which shall include as appropriate the following for controlling Visible Emissions:

(a) Water Application;
(b) Dust Suppressants; and
(c) Wind Screens

(Ref.: PSD Construction Plan Issued Issuance Date)

III.19 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit PM/PM10/PM2.5 emissions to no more than 0.005 gr/dscf and use a baghouse for PM control (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.20 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall limit PM emissions to no more than 0.99 lb/MW-hr for determining compliance with 40 CFR 60, Subpart Z. (Ref.: 40 CFR 60.262(a)(1))

III.21 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit emissions of Greenhouse Gases, expressed as Carbon Dioxide equivalent, to no more than 95,467 tpy per furnace and 381,866 tpy for all four furnaces combined, as determined for each consecutive 12-month period, and shall also use semi-enclosed furnaces and employ good operating and maintenance techniques (BACT for GHG (as CO2e)). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.22 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit NOx emissions to no more than 45.0 lbs/ton as determined by a 3-hr rolling average period of Silicon produced (BACT for NOx). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.23 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit CO emissions to no more than 34.0 lbs/ton, as determined by a 3-hr rolling average period of Silicon produced, and Utilize Good Combustion and Operation Practices and Semi-Enclosed Furnaces (BACT for CO). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.24 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall limit CO emissions to no more than 20 volume percent on a dry basis for determining compliance with 40 CFR 60, Subpart Z. (Ref.: 40 CFR 60.263(a)). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.25 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit SO2 emissions to no more than 52.0 lbs/ton, as determined by a 3-hr rolling average period of Silicon produced, and Utilize Low Sulfur Content Material where technically feasible (BACT for SO2). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.26 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit VOC emissions to no more than 2.4 lbs/ton, as determined by a 30-day rolling average period of Silicon produced, and Utilize Good Operating Practices (BACT for VOC). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.27 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall install, calibrate, maintain, and operate a Continuous Opacity Monitoring (COM) Device as specified in 40 CFR 60.264(a). (Ref.: 40 CFR 60.264(a)).

III.28 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 – Subpart Z. and report as excess emissions all six-minute periods in which the average opacity is 3 perrcent or greater leaving the control device (i.e., fabric filter) as required by the federally enforceable PSD Construction herein. For Emission Point AA-200 (Silicon Processing), the permittee shall have emissions of Opacity equal to or less than 6% exiting the roof vents or areas where the Silicon is melted and refined. (Ref.: 40 CFR 264(b) for AA-201 and PSD Construction Perrmit issued Issuance Date for AA-200 and AA-201)

III.29 For Emission Point AA-201a (Casting Frames), the permittee shall implement a system for ensuring that a system of Best Management Practices is implemented to minimize the generation of fugitive particulate emissions (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.30 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of NOx to no more than 0.08 lbs/MMBtu and utilize low NOx or equivalent burners/technology, combust clean fuel only and implement good combustion practices (BACT for NOx). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.31 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of Greenhouse Gases (GHG) to the following BACT emissions limitations (BACT for GHG):

(a) Carbon Dioxide (CO2) emissions to no more than 117 lb/MMBtu
(b) Methane emissions to no more than 0.0022 lb/MMBtu
(c) Nitrous Oxide emissions to no more than 0.0002 lb/MMBtu
(d) Good Combustion Practices, Combustion of Natural Gas Only, Periodic Maintenance, and energy efficient burner design including Low NOx burners or equivalent.

(Ref.: PSD Construction Permit Issued November 27, 2013)

III.32 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of PM/PM10/PM2.5 to no more than 0.0076 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.33 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of CO to no more than 0.0840 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for CO). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.34 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of SO2 to no more than 0.0006 lbs/MMBtu, combust clean fuels only (i.e., natural gas only), and utilize good combustion practices (BACT for SO2). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.35 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of VOC to no more than 0.0055 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for VOC). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.36 For Emission Point AA-404 (Silica Fume Silo), the permittee shall limit emissions of PM/PM10/PM2.5 to no more than 0.01 gr/dscf for PM/PM10/PM2.5 and the use of Bin Vent Filter (BACT for PM/PM10/PM2/5). (PSD Construction Permit Issued November 27, 2013)

III.37 For Emission Point AA-404 (Silica Fume Silo), the permittee is subject to 40 CFR 60.262(b) and shall limit emissions of Opacity from the Dust Handling Equipment to no more than 10% at any time. (Ref.: 40 CFR 60.262(b))

III.38 For Emission Point AA-501 (Emergency Generators), the permittee shall utilize Good Combustion and Operating Practices, utilize Ultra Low Sulfur Diesel (ULSD) Fuel, and comply with 40 CFR 60 – Subpart IIII for demonstrating compliance with PM/PM10/PM2.5, CO, VOC, NOx, and SO2. (BACT for PM/PM10/PM2.5, CO, and VOC is the Good Combustion and Operating Practices as well as complying with Subpart IIII and BACT for NOx and SO2 is Good Combustion and Operating Practices, compliance with Subpart IIII, and use of ULSD Fuel). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.39 For Emission Point AA-501, the permittee is subject to 40 CFR 60 – New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines (Subpart IIII), specifically 40 CFR 60.4200(a)(2)(i), and shall comply with the applicable provisions. (Ref.: 40 CFR 60.4200(a)(2)(i))

III.40 For Emission Point AA-501, the permittee is subject to 40 CFR 60.4206 and shall comply with the applicable provisions and achieve the emission standards over the life of the engine. (Ref.: 40 CFR 60.4206)

III.41 For Emission Point AA-501, the permittee is subject to 40 CFR 4205(b) and shall comply with the applicable provision and shall achieve compliance with the emission standards. (Ref.: 40 CFR 4205(b))

III.42 For Emission Point AA-501, the permittee is subject to 40 CFR 4207(b) and shall comply with the Diesel Fuel Requirements of 40 CFR 50.510(b). (Ref.: 40 CFR 40.4207(b))

III.43 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 64.2(a) – Compliance Assurance Monitoring (CAM) Provisions where applicable and the applicable CAM Plan is not due until the Title V Permit to Operate is due, which is specified herein, as a requirement upon certification of construction (i.e., Condition I.16). (Ref.: 40 CFR 64.2(a))

III.44 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 60.260 – Subpart Z, Standards of Performance for Ferroalloy Production Facilities and shall comply with the applicable provisions. (Ref.: 40 CFR 60.260)

III.45 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11524(a) and (b)(2) – Subpart YYYYYY, National Emission Standards for Hazardous Air Pollutants for Area Sources: Ferroalloy Production Facilities and shall comply with the applicable provisions. (Ref.: 40 CFR 63.11524(a) and (b)(2))

III.46 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11525(c) and shall comply upon startup of the Ferroalloy Production Facility. (Ref.: 40 CFR 63.11525(c))

III.47 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11526 and shall comply with the following for demonstrating compliance with MACT YYYYYY:

(a) You shall not discharge to the atmosphere visible emissions (VE) from the control device that exceed 5 percent of accumulate occurrences in a 60-minute observation period.

(b) You shall not discharge to the atmosphere fugitive PM emissions from the furnace building containing the electrometallurgical operations that exhibit opacity greater than 20 percent (6-minute average), except for one 6-minute average per hour that does not exceed 60 percent.

(Ref.: 40 CFR 63.11526)

III.48 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63 – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines and shall comply with this subpart by demonstrating compliance with the applicable provisions of 40 CFR 60 – Subpart IIII, as specified in 40 CFR 63.6585(a) and (c) via 63.6590(c). (Ref.: 40 CFR 63.6585(a) and (c) via 63.6590(c))

III.49 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Opacity to no more than 10% at any time. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.50 For Emission Point AA-405 (Insignificant Activities), the maximum permissible emission of ash and/or particulate matter from each fossil fuel burning installations of less than 10 million BTU per hour heat input shall not exceed 0.6 pounds per million BTU per hour heat input. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.D(1)(a).)

III.51 For Emission Point AA-405 (Insignificant Activities), the maximum permissible emission of ash and/or particulate matter from fossil fuel burning installations equal to or greater than 10 million BTU per hour heat input but less than 10,000 million BTU per hour heat input shall not exceed an emission rate as determined by the relationship

$$E = 0.8808*I^{-0.1667}$$

where E is the emission rate in pounds per million BTU per hour heat input and I is the heat input in millions of BTU per hour. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.D(1)(b).)

III.52 For Emission Point AA-405 (Insignificant Activities), the permittee shall not cause the maximum discharge of particulate matter to exceed 0.2 grains per standard dry cubic foot of flue gas calculated to twelve percent (12%) carbon dioxide by volume for products of combustion. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.H(1).)

III.53 For Emission Point AA-405 (Insignificant Activities), the permittee shall not cause the maximum discharge of sulfur oxides from any fuel burning installations in which the fuel is burned primarily to produce heat or power by indirect heat transfer to exceed 4.8 pounds(measured as sulfur dioxide) per million BTU heat input. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.4.A(1).)

III.54 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is only authorized to operate two (2) out of the four (4) Submerged Arc Furnaces at any given time and shall never operate all four combined Submerged Arc Furnaces at one time. (Ref.: PSD Construction issued Issuance Date)

III.55 For Emission Pint AA-201 (Submerged Arc Furnaces), the permittee can formally request a modification to this permit to remove the restriction on the number of Submerged Arc Furnaces that can operate at any given time. To request elimination of this restriction via permit modication, the permittee must submit a demonstration to the MDEQ, EPA, and the FLM that operation of 3 or 4 Submerged Arc Furnaces simultaneously would not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS), or exceed the visibility thresholds or deposition analysis thresholds (DAT) for Sipsey Wilderness or Mingo National Wildlife Refuge (both are federally mandated Class I areas). The applicant will follow EPA's Appendix W requirements and the 2010 Federal Land Managers' Air Quality Related Values Workgroup (FLAG) document for conducting an air quality impact evaluation to Class II and Class I areas, respectively. Operation of 3 or 4 Submerged Arc Furnaces at any given time can only occur after a PSD permit modification is issued by MDEQ. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.56 For Emission Point AA-000 (Entire Facility), Startup and Shutdown emissions have been accounted for in the individual emission limitations for the facility including the BACT emission limitations, and therefore all emission point specific limits of the federally enforceable permit herein apply at all times including startup and shutdown. The necessary monitoring (i.e., Continuous Emissions Monitoring Systems, Performance Testing) should validate the potential emissions when these events occur. Malfunction emissions are those emissions that would normally not occur because of unforeseen instances and not part of any routine or normal method of operation as defined by 11 Miss. Admin. Code Pt. 2, Ch. 1. (Ref.: PSD Construction Permit Issued November 27, 2013)

PART IV
EMISSION POINT SPECIFIC MONITORING REQUIREMENTS

AA-000 *(Entire Facility)*	PSD Construction Permit Issued November 27, 2013	IV.1	Silicon Production	Determine the Production for each consecutive 12-month period
		IV.2	Natural Gas Combustion	Determine the total Combustion Rate
		IV.3	Opacity	Determine using Method 22 and then Method 9 if emissions are present
		IV.4	Pretest Conference/ Protocol	30-days prior to performance testing if requested by MDEQ upon 60 day advanced of Stack Test Protocol
		IV.5	Control Equipment	Regular Maintenance shall be performed and kept in log form
		IV.6	NOx	Determine the Emission Rate for each consecutive 12 month period
		IV.7	CO	
		IV.8	SO2	
		IV.9	VOC	
		IV.10	PM/PM10	
		IV.11	PM2.5	
		IV.12	HAP	
AA-101 *(Coal Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period
AA-101a (Coal Conveyance)	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT

AA-102 ***(Wood Storage Pile Material Handling)***	**PSD Construction Permit Issued November 27, 2013**	**IV.13**	**PM/PM10/ PM2.5**	**Implement and Develop a Dust Control Plan for demonstrating compliance with BACT**
		IV.14	**Material Throughput Rate**	**Determine the Material Throughput Rate for each consecutive 12 month period**
AA-102a (Wood Conveyance)	**PSD Construction Permit Issued November 27, 2013**	**IV.13**	**PM/PM10/ PM2.5**	**Implement and Develop a Dust Control Plan for demonstrating compliance with BACT**
AA-102b ***(Wood Chipper)***	**PSD Construction Permit Issued November 27, 2013**	**IV.13**	**PM/PM10/ PM2.5**	**Implement and Develop a Dust Control Plan for demonstrating compliance with BACT**
AA-103 ***(Quartz Storage Pile Material Handling)***	**PSD Construction Permit Issued November 27, 2013**	**IV.13**	**PM/PM10/ PM2.5**	**Implement and Develop a Dust Control Plan for demonstrating compliance with BACT**
		IV.14	**Material Throughput Rate**	**Determine the Material Throughput Rate for each consecutive 12 month period**
AA-103a (Quartz Conveyance)	**PSD Construction Permit Issued November 27, 2013**	**IV.13**	**PM/PM10/ PM2.5**	**Implement and Develop a Fugitive Dust Control Plan for demonstrating compliance with BACT**
AA-104 ***(Limestone Storage Pile Material Handling)***	**PSD Construction Permit Issued November 27, 2013**	**IV.13**	**PM/PM10/ PM2.5**	**Implement and Develop a Dust Control Plan for demonstrating compliance with BACT**
		IV.14	**Material Throughput Rate**	**Determine the Material Throughput Rate for each consecutive 12 month period**
AA-105 ***(Storage Piles Processing)***	**PSD Construction Permit Issued November 27, 2013**	**IV.13**	**PM/PM10/ PM2.5**	**Implement and Develop a Fugitive Dust Control Plan for demonstrating compliance with BACT**

AA-106 *(Storage Pile Wind Erosion)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.15	GHG (as CO2e)	Determine the CO2e Emission Rate for each consecutive 12 month period
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued November 27, 2013	IV.16	NOx	Installation and Operation of CEMS
			CO	
			SO2	
			VOC	Initial Performance Test for Demonstrating Operational Ranges
			PM/PM10	
			PM2.5	
AA-201 *(Submerged Arc Furnaces)*	40 CFR 60.264	IV.17	NSPS Subpart Z	COMs Requirements
	40 CFR 60.265	IV.18		Monitoring of Operations
	40 CFR 60.266	IV.19		Compliance with Test Methods and Procedures
	40 CFR 63.11527(a)	IV.25	MACT Subpart YYYYYY	Monitoring
	40 CFR 63.11528	IV.26		Performance Testing and Compliance Requirements
AA-201a *(Casting Frames)*	PSD Construction Permit Issued November 27, 2013	IV.20	PM/PM10/ PM2.5	Utilize Best Management Practices for demonstrating compliance with BACT

AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued November 27, 2013	IV.21	NOx	Utilize Good Combustion Practices and Implement Maintenance Guidelines for demonstrating compliance with BACT
			GHG	
			PM/PM10/ PM2.5	
			CO	
			SO2	
			VOC	
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued November 27, 2013	IV.22	PM/PM10/ PM2.5	Implement Maintenance Guidelines for demonstrating compliance with BACT
			CO	
			VOC	
			NOx	
			SO2	

AA-501 *(Emergency Generators)*	40 CFR 60.4209	IV.23	NSPS Subpart IIII	Monitoring and Compliance Requirements
	40 CFR 60.4211(a), (c), (f), and (g)	IV.24		

IV.1 For Emission Point AA-000 (Entire Facility), the permittee shall determine the Silicon Produced for each consecutive 12-month period by obtaining data from purchasing, processing, and production, and any other data necessary to determine the facility wide production rate as determined for each consecutive 12-month period, for demonstrating compliance with Condition III.1 of the permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.2 For Emission Point AA-000 (Entire Facility), the permittee shall determine the Natural Gas Combustion Rate total for each consecutive 12-month period by utilizing energy records, reports, and any other data necessary to determine the facility wide Natural Gas Combustion Rate for determining compliance with Condition III.2 of the permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.3 For Emission Point AA-000 (Entire Facility), the permittee shall perform weekly Visual Emission Evaluations (VEEs/Observations) by Method 22, 40 CFR 60, Appendix A. Observations shall be conducted during daylight hours and while the equipment is in operation. If visible emissions are observed, excluding condensed water water vapor, the permittee shall:

(a) Within 24 hours, take corrective action that eliminates the visible emissions or verify that the unit causing the emission and any associated air pollution control equipment are operating normally in accordance with desiggn and standards procedures, and under the same conditions in which compliance was achieved in the past, and

(b) If visible emissions are not eliminated, have a certified visual emissions observer determine compliance with the opacity standard using EPA Reference Method 9 within three business days, and

(c) Report the visible emissions as a potential deviation (or as a violation if demonstrated by EPA Reference Method 9) according to the reporting requirements of this permit.

(Ref.: PSD Construction Permit Issued November 27, 2013)

IV.4 For Emission Point AA-000 (Entire Facility), the permittee shall submit a Performance Test Protocol 60 days prior to any Performance Test. Upon receipt of the Performance Test Protocol, the MDEQ may request a Pretest Conference to discuss the Performance Testing at least 30 days in advance of the Performance Test to discuss the Peformance Test or Performance Test Protocol. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.5 For Emission Point AA-000 (Entire Facility), the permittee shall perform regular maintenance on the control equipment according to the manufacturer design and recommendations. This maintenance shall be kept in log form and made available to MDEQ during inspections. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.6 For Emission Point AA-000 (Entire Facility), the permittee shall determine the NOx emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.3 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.7 For Emission Point AA-000 (Entire Facility), the permittee shall determine the CO emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.4 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.8 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the SO2 emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.5 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.9 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the VOC emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.6 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.10 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the PM/PM10 emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.7 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.11 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the PM2.5 emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.8 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.12 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the HAP (Individual and Combined) emission rates as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.9 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.13 For Emission Points AA-101 (Coal Storage Pile Material Handling), AA-101a (Coal Conveyance), AA-102 (Wood Storage Pile Material Handling), AA-102a (Wood

Conveyance), AA-102b (Wood Chipper), AA-103 (Quartz Storage Pile Material Handling), AA-103a (Quartz Conveyance), AA-104 (Limestone Storage Pile Material Handling), AA-105 (Storage Piles Processing), AA-106 (Storage Pile Wind Erosion), AA-301 (Silicon Grinding and Milling), AA-402 and AA-402a (Unpaved and Paved Roads and Plantwide Transport Fugitive Emissions), the permittee shall develop and implement a Dust Control Plan for demonstrating compliance with the individual BACT Limits for PM/PM10/PM2.5, specifically Conditions III. III.10, III.12, III.14, III.17, and III.18, of the federally enforceable permit herein. For each emission point that operates a baghouse, the permittee shall install, maintain, and operate a continuous pressure drop monitor to monitor and record the differential pressure at least every 15 minutes. For each baghouse, the permittee shall establish a pressure drop range based on stack test data, vendor information, operational history, and/or visual inspections that indicates proper operation of the baghouse. These pressure drop ranges shall be maintained at the facility and be made available upon request from MDEQ personnel. Should a pressure drop reading fall outside the established range, the permittee shall immediately inspect the baghouse to determine the cause of the excursion and return the baghouse to normal operating conditions. The emission point ID, date, time, length of the excursion, and reason for an excursion from an established pressure drop range shall be recorded and any corrective measures taken to restore the baghouse to normal operating conditions shall be noted. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.14 For Emission Points AA-101 (Coal Storage Pile Material Handling), AA-102 (Wood Storage Pile Material Handling), AA-103 (Quartz Storage Pile Material Handling), and AA-104 (Limestone Storage Pile Material Handling), the permittee shall determine the Material Throughput Rate as determined for each consecutive 12-month period by utilizing data obtained from Purchasing Records, Production Records, and any other data necessary to demonstrate compliance with Condition III.11, III.13, III.15, and III.16, of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.15 For Emission Point AA-201 (Submerged Arc Furnaces), the permitee shall determine the CO2e emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III. 21 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.16 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee shall install and operate a Continuous Emission Monitoring (CEM) System on the furnace baghouses for monitoring NOx, CO, and SO2 immediately upon operation of the furnaces and not beginning operation as defined by Condition I.15 of the federally enforceable permit herein (i.e, for the purpose of this permit and this condition specifically, the furnace baghouses will be treated as stand-alone units so that the CEMS will be installed sooner rather than later with regard to monitoring and compliance). The CEMS shall meet the applicable performance specification required by 40 PART 60, Appendix B, the applicable quality assurance procedures required by 40 CFR Part 60, Appendix F, and the requirements of 40 CFR 60.13. In lieu of the requirements of 40 CFR Part 60, Appendix F, 5.1.1, 5.1.3, and 5.1.4, the permittee may conduct either a Relative Accuracy Audit (RAA) or a Relative

Accuracy Test Audit (RATA) on each CEMs at least once every three (3) years. The permittee shall conduct Cylinder Gas Audits (CGA) each calendar quarter during which a RAA or a RATA is not performed. A CEMS is not required for PM, PM10, PM2.5 and VOC, but rather the permittee is required to perform an initial stack test within 180 days of reaching maximum production (not to exceed three years from start-up of Phase 1 of the facility) and develop operational ranges for demonstrating compliance with the PM, PM10, PM2.5 and VOC BACT limits. The permittee shall utilize Method 5 for PM/PM10, Method 201A for PM2.5, and Method 25A for VOC. The permittee shall repeat the performance if the facility's operations change such that the operational ranges would no longer be valid for determining compliance with the PM, PM10, PM2.5 or VOC BACT limits. The permittee may be required to repeat the Operation Range Performance Test at the MDEQ's discretion and request at any time during the Operating Permit (Title V) Term if the MDEQ determines necessary. During the performance test, the permittee shall monitor the following:

(a) Charge Weights and Materials, Tap Weights, and Materials;
(b) Heat Times, including Start and Stop Times, and a log of Process Operations, Including periods of no Operations during testing;
(c) Control Device Operation Log; and
(d) Continuous Monitor or Reference Method 9 data which is required to be performed and documented during said Performance Test.

In the event that the CEMS fails* so that the permittee cannot collect emissions data for NOx, CO, and SO2, the permittee will performance test for NOx, CO, and SO2 at a frequency of no less than monthly until such time that the CEMS system is performing to the manufacturer design and specification as required and specified in the above condition. *Failure of the CEMS is to be determined by the staff of the MDEQ so that the permittee must expediently and readily develop a means of correcting the systems for collecting and measuring emissions in a timely manner.

(Ref.: PSD Construction Permit Issued November 27, 2013)

IV.17 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.264 and shall comply with the following emissions monitoring requirements for demonstrating compliance:

(a) The permittee is subject to the provisions of this subpart shall install, calibrate, maintain and operate a continuous monitoring system for measurement of the opacity of emissions discharged into the atmosphere from the control device(s).

(b) For the purpose of reports required under 40 CFR 60.7(c), the permittee shall report as excess emissions all six-minute periods in which the average opacity is 15 percent or greater.

(c) The permittee subject to the provisions of this subpart shall submit a written

report of any product change to the DEQ. Reports of product changes must be postmarked not later than 30 days after implementation of the product change.

(Ref.: 40 CFR 60.264)

IV.18 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.265 and shall monitor the following operations for demonstrating compliance:

(a) The permittee of any electric submerged arc furnace subject to the provisions of this subpart shall maintain daily records of the following information:

(1) Product being produced.
(2) Description of constituents of furnace charge, including the quantity, by weight.
(3) Time and duration of each tapping period and the identification of material tapped (slag or product.)
(4) All furnace power input data obtained under paragraph (b) of this section.
(5) All flow rate data obtained under paragraph (c) of this section or all fan motor power consumption and pressure drop data obtained under paragraph (e) of this section.

(b) The permittee subject to the provisions of this subpart shall install, calibrate, maintain, and operate a device to measure and continuously record the furnace power input. The furnace power input may be measured at the output or input side of the transformer. The device must have an accuracy of ±5 percent over its operating range.

(c) The permittee subject to the provisions of this subpart shall install, calibrate, and maintain a monitoring device that continuously measures and records the volumetric flow rate through each separately ducted hood of the capture system, except as provided under paragraph (e) of this section. The permittee of an electric submerged arc furnace that is equipped with a water cooled cover which is designed to contain and prevent escape of the generated gas and particulate matter shall monitor only the volumetric flow rate through the capture system for control of emissions from the tapping station. The permittee may install the monitoring device(s) in any appropriate location in the exhaust duct such that reproducible flow rate monitoring will result. The flow rate monitoring device must have an accuracy of ±10 percent over its normal operating range and must be calibrated according to the manufacturer's instructions. The DEQ may require the permittee to demonstrate the accuracy of the monitoring device relative to Methods 1 and 2 of appendix A to this part.

(d) When performance tests are conducted under the provisions of 40 CFR 60.8 of this part to demonstrate compliance with the standards under 40 CFR 60.262(a) (4) and (5), the volumetric flow rate through each separately ducted hood of the capture system must be determined using the monitoring device required under paragraph (c) of this section. The volumetric flow rates must be determined for furnace power input levels at 50 and 100 percent of the nominal rated capacity of the electric submerged arc furnace. At all times the electric submerged arc furnace is operated, the permittee shall maintain the volumetric flow rate at or above the appropriate levels for that furnace power input level determined during the most recent performance test. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator shall maintain the exhaust flow rates through the capture system over the tapping station at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the DEQ to be unacceptable operation and maintenance of the affected facility. The owner or operator may request that these flow rates be reestablished by conducting new performance tests under 40 CFR 60.8 of this part.

(e) The permittee may as an alternative to paragraph (c) of this section determine the volumetric flow rate through each fan of the capture system from the fan power consumption, pressure drop across the fan and the fan performance curve. Only data specific to the operation of the affected electric submerged arc furnace are acceptable for demonstration of compliance with the requirements of this paragraph. The permittee shall maintain on file a permanent record of the fan performance curve (prepared for a specific temperature) and shall:

(1) Install, calibrate, maintain, and operate a device to continuously measure and record the power consumption of the fan motor (measured in kilowatts), and

(2) Install, calibrate, maintain, and operate a device to continuously measure and record the pressure drop across the fan. The fan power consumption and pressure drop measurements must be synchronized to allow real time comparisions of the data. The monitoring devices must have an accuracy of ±5 percent over their normal operating ranges.

(f) The volumetric flow rate through each fan of the capture system must be determined from the fan power consumption, fan pressure drop, and fan performance curve specified under paragraph (e) of this section, during any performance test required under 40 CFR 60.8 to demonstrate compliance with the standards under 40 CFR 60.262(a)(4) and (5). The permittee shall determine the volumetric flow rate at a representative temperature for furnace power input levels of 50 and 100 percent of the nominal rated capacity of the

electric submerged arc furnace. At all times the electric submerged arc furnace is operated, the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow rate is at or above the levels established during the most recent performance test for that furnace power input level. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow rate is at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the DEQ to be unacceptable operation and maintenance of the affected facility. The permittee may request that these flow rates be reestablished by conducting new performance tests under 40 CFR 60.8. The DEQ may require the owner or operator to verify the fan performance curve by monitoring necessary fan operating parameters and determining the gas volume moved relative to Methods 1 and 2 of appendix A to this part.

(g) All monitoring devices required under paragraphs (c) and (e) of this section are to be checked for calibration annually in accordance with the procedures under 40 CFR 60.13(b).

(Ref.: 40 CFR 60.265)

IV.19 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.266 and shall comply with the following Test Methods and Procedures:

(a) During any performance test required in 40 CFR 60.8, the permittee shall not allow gaseous diluents to be added to the effluent gas stream after the fabric in an open pressurized fabric filter collector unless the total gas volume flow from the collector is accurately determined and considered in the determination of emissions.

(b) In conducting the performance tests required in 40 CFR 60.8, the permittee shall use as reference methods and procedures the test methods in appendix A of this part or other methods and procedures as specified in this section, except as provided in 40 CFR 60.8(b).

(c) The permittee shall determine compliance with the particulate matter standards in 40 CFR 60.262 as follows:

(1) The emission rate (E) of particulate matter shall be computed for each run using the following equation:

$$E = \left[\left(\sum_{i=1}^{N} C_{si} Q_{sdi}\right)\right] / (PK)$$

where:

E=emission rate of particulate matter, kg/MW-hr (1b/MW-hr).
n=total number of exhaust streams at which emissions are quantified.
c_{si} =concentration of particulate matter from exhaust stream "i", g/dscm (gr/dscf).
Q_{sdi} =volumetric flow rate of effluent gas from exhaust stream "i", dscm/hr (dscf/hr).
P=average furnace power input, MW.
K=conversion factor, 1000 g/kg (7000 gr/lb).

(2) Method 5 shall be used to determine the particulate matter concentration (c_{si}) and volumetric flow rate (Q_{sdi}) of the effluent gas, except that the heating systems specified in sections 2.1.2 and 2.1.6 are not to be used when the carbon monoxide content of the gas stream exceeds 10 percent by volume, dry basis. If a flare is used to comply with 40 CFR 60.263, the sampling site shall be upstream of the flare. The sampling time shall include an integral number of furnace cycles.

(i) When sampling emissions from open electric submerged arc furnaces with wet scrubber control devices, sealed electric submerged arc furnaces, or semienclosed electric arc furnaces, the sampling time and sample volume for each run shall be at least 60 minutes and 1.80 dscm (63.6 dscf).

(ii) When sampling emissions from other types of installations, the sampling time and sample volume for each run shall be at least 200 minutes and 5.66 dscm (200 dscf).

(3) The measurement device of 40 CFR 60.265(b) shall be used to determine the average furnace power input (P) during each run.

(4) Method 9 and the procedures in 40 CFR 60.11 shall be used to determine opacity.

(5) The emission rate correction factor, integrated sampling procedure of Method 3B shall be used to determine the CO concentration. The sample shall be taken simultaneously with each particulate matter sample.

(d) During the particulate matter run, the maximum open hood area (in hoods with segmented or otherwise moveable sides) under which the process is expected to be operated and remain in compliance with all standards shall be recorded. Any future operation of the hooding system with open areas in excess of the maximum is not permitted.

(e) To comply with 40 CFR 60.265 (d) or (f), the permittee shall use the monitoring devices in 40 CFR 60.265 (c) or (e) to make the required measurements as determined during the performance test.

(Ref.: 40 CFR 60.266)

IV.20 For Emission Point AA-201a (Casting Frames), the permittee shall utilize Best Management Practices for demonstrating compliance with the minimization of fugitive particulate emissions as required by Condition III.29 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.21 For Emission Point AA-202 (Ladle Preheaters), the permittee shall utilize Good Combustion Practices and Implement Maintenance Guidelines for demonstrating compliance with the NOx, GHG, PM/PM10/PM2.5, CO, SO2, and VOC BACT Limits as described in Conditions III.29, III.30, III.31, III.32, III.33, and III.34 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.22 For Emission Point AA-501 (Emergency Generators), the permittee shall implement Maintenance Guidelines for demonstrating compliance with PM/PM10/PM2.5, CO, VOC, NOx, and SO2 BACT limits as described in Condition III.37 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.23 For Emission Point AA-501 (Emergency Generators), if the permittee is subject to the monitoring provisions then the permittee shall also comply with the Monitoring and Compliance Requirements of 40 CFR 60.4209 and either comply by installing a non-resettable hour meter or a diesel particulate filter with a backpressure monitor. (Ref.: 40 CFR 60.4209)

IV.24 For Emission Point AA-501 (Emergency Generators), if the permittee is subject to the emissions standards of 40 CFR 60 – Subpart IIII, the permittee shall comply with the requirements of 40 CFR 60.4211(a), (c), (f), and (g)). (Ref.: 40 CFR 60.4211(a), (c), (f), and (g))

IV.25 For Emission Point AA-201 (Submerged Arc Furnacec), the permittee is subject to the monitoring provision of 40 CFR 63, Subpart YYYYYY and shall comply with the following:

(a) Each *EAF equipped with fabric filters* —

(1) *Visual monitoring.* The permittee shall perform visual monitoring of the monovent or fabric filter outlet stack(s) for any VE according to the schedule specified in paragraphs (a)(1)(i) and (a)(1)(ii) of this section.

(i) *Daily visual monitoring.* Perform visual determination of fugitive emissions once per day, on each day the process is in operation, during operation of the process.

(ii) *Weekly visual monitoring.* If no visible fugitive emissions are detected in consecutive daily visual monitoring performed in accordance with paragraph (a)(1)(i) of this section for 90 days of operation of the process, the permittee may decrease the frequency of visual monitoring to once per calendar week of time the process is in operation, during operation of the process. If visible fugitive emissions are detected during these inspections, the permittee shall resume daily visual monitoring of that operation during each day that the process is in operation, in accordance with paragraph (a)(1)(i) of this section until the permittee satisfies the criteria of this section to resume conducting weekly visual monitoring.

(2) If the visual monitoring reveals the presence of any VE, the permittee shall conduct a Method 22 (appendix A-7 of 40 CFR part 60) test following the requirements of 40 CFR 63.11528(b)(1) within 24 hours of determining the presence of any VE.

(3) If you own or operate an existing affected source, the permittee shall install, operate, and maintain a bag leak detection system for each fabric filter as an alternative to the monitoring requirements in paragraph (a)(1) of this section. If the permittee owns or operates a new affected source, the permittee shall install, operate, and maintain a bag leak detection system for each fabric filter according to the requirements in paragraphs (a)(3)(i) through (a)(3)(vii) of this section. Such source is not subject to the requirements in paragraphs (a)(1) and (a)(2) of this section.

(i) The system must be certified by the manufacturer to be capable of detecting emissions of PM at concentrations of 10 milligrams per actual cubic meter (0.00044 grains per actual cubic foot) or less.

(ii) The bag leak detection system sensor shall provide output of relative PM loadings and the owner or operator shall continuously record the output from the bag leak detection system using a strip chart recorder, data logger, or other means.

(iii) The system must be equipped with an alarm that will sound when an increase in relative PM loadings is detected over the alarm set point established in the operation and maintenance plan, and the alarm must be located such that it can be heard, seen, or otherwise detected by the appropriate plant personnel.

(iv) The initial adjustment of the system must, at minimum, consist of establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device, and establishing the alarm set points. If the system is equipped with an alarm delay time feature, the permittee shall also must establish a maximum reasonable alarm delay time.

(v) Following the initial adjustment, do not adjust the sensitivity or range, averaging period, alarm set point, or alarm delay time, except that, once per quarter, the permittee may adjust the sensitivity of the bag leak detection system to account for seasonal effects including temperature and humidity.

(v) For fabric filters that are discharged to the atmosphere through a stack, the bag leak detector sensor shall be installed downstream of the fabric filter and upstream of any wet scrubber.

(vi) Where multiple detectors are required, the system's instrumentation and alarm may be shared among detectors.

(4) When operating a bag leak detection system, if an alarm sounds, conduct visual monitoring of the monovent or fabric filter outlet stack(s) as required in paragraph (a)(1) of this section within 1 hour. If the visual monitoring reveals the presence of any VE, the permittee shall conduct a Method 22 test following the requirements of 40 CFR 63.11528(b)(1) within 24 hours of determining the presence of any VE.

(5) The permittee shall prepare a site-specific monitoring plan for each bag leak detection system. The permittee shall operate and maintain each bag leak detection system according to the plan at all times. Each plan must address all of the items identified in paragraphs (a)(5)(i) through (a)(5)(v)of this section.

(i) Installation of the bag leak detection system.

(ii) Initial and periodic adjustment of the bag leak detection system including how the alarm set-point and alarm delay time will be established.

(iii) Operation of the bag leak detection system including quality assurance procedures.

(iv) Maintenance of the bag leak detection system including a routine maintenance schedule and spare parts inventory list.

(v) How the bag leak detection system output will be recorded and stored.

(Ref.: 40 CFR 63.11527(a))

IV.26 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject 40 63.11528 and shall comply with the Performance Testing and Compliance Requirements as follows:

(a) *Initial compliance demonstration deadlines.* The permittee shall conduct an initial Method 22 (appendix A-7 of 40 CFR part 60) test following the requirements of paragraph (b)(1) of this section of each existing electrometallurgical operation control device and an initial Method 9 observation following the requirements of paragraph (c)(1) of this section from the furnace building due to electrometallurgical operations no later than 60 days after your applicable compliance date. For any new electrometallurgical operation control device, the permittee shall conduct an initial Method 22 test following the requirements of paragraph (b)(1) of this section within 15 days of startup of the control device.

(b) *Visible emissions limit compliance demonstration.*

(1) The permittee shall conduct a Method 22 (appendix A-7 of 40 CFR part 60) test to determine that VE from the control device do not exceed the emission standard specified in 40 CFR 63.11526(a). For a fabric filter, conduct the test for at least 60 minutes at the fabric filter monovent or outlet stack(s), as applicable. For a wet scrubber, conduct the test for at least 60 minutes at the outlet stack(s).

(2) The permitee shall conduct a semiannual Method 22 test using the procedures specified in paragraph (b)(1) of this section.

(c) *Furnace building opacity.*

(1) The permittee shall conduct an opacity test for fugitive emissions from the furnace building according to the procedures in 40 CFR 63.6(h) and Method 9 (appendix A-4 of 40 CFR part 60). The test shall be conducted for at least 60 minutes and shall include tapping the furnace or reaction vessel. The observation shall be focused on the part of the building where electrometallurgical operation fugitive emissions are most likely to be observed.

(2) Conduct subsequent Method 9 tests no less frequently than every 6 months and each time the permittee makes a process change likely to increase fugitive emissions.

(3) After the initial Method 9 performance test, as an alternative to the Method 9 performance test, the permittee may monitor VE using Method 22 (appendix A-7 of 40 CFR part 60) for subsequent semi-annual compliance demonstrations. The Method 22 test is successful if no VE are observed for 90 percent of the readings over the furnace cycle (tap to tap) or 60 minutes, whichever is longer. If VE are observed greater than 10 percent of the time over the furnace cycle or 60 minutes, whichever is longer, then the facility shall conduct another test as soon as possible, but no later than 15 calendar days

after the Method 22 test using Method 9 (appendix A-4 of 40 CFR part 60) as specified in paragraph (c)(1) of this section.

(Ref.: 40 CFR 63.11528)

PART V
EMISSION POINT SPECIFIC
RECORDKEEPING AND/OR REPORTING REQUIREMENTS

AA-000 *(Entire Facility)*	PSD Construction Permit Issued November 27, 2013	V.1	Performance Testing	Submit Results no later than 60 days following actual test
		V.2	Natural Gas Combustion	Maintain Records and Submit Semi-Annual Records of Usage Rate
		V.3	Silicon Production	Maintain All Records and Submit a Semi-Annual Production Report for each consecutive 12-month period
		V.4	NOx	Maintain All Records and Submit Semi-Annually to Demonstrate Compliance with consecutive 12-month period Individual and Combined Emission Limitations and/or Individual and Combined BACT Emission Limitation
			CO	
			SO2	
			VOC	
			PM/PM10	
			PM2.5	
			HAP	
			GHG (CO2e)	
AA-100 *(Raw Material Receiving and Handling Operations)*	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
		V.6	Material Throughput Rate	Semi-Annual Report the Material Throughput Rate for each consecutive 12 month period
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued November 27, 2013	V.7	NOx	Submit Semi-Annual Report of Emission from CEMs Data
			CO	
			SO2	
		V.8	VOC	Submit Semi-Annual Report of Emissions utilizing Data obtained from Performance Testing
			PM/PM10/ PM2.5	

AA-201 *(Submerged Arc Furnaces)*	40 CFR 60.264(c)	V.9	NSPS Subpart Z	Product Change Notification Report
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Maintain and Submit Semi-Annual Reports that the permittee is in compliance with the Dust Control Plan
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued November 27, 2013	V.10	NOx	Maintain and Submit Semi-Annual Reports of Emissions and Use of Low Sulfur Fuel Oil for each consecutive 12-month period
			CO	
			SO2	
			VOC	
			PM/PM10/ PM2.5	
AA-000 *(Entire Facility)* *where applicable	40 CFR 63.11529(a)	V.11	MACT Subpart YYYYYY	Initial Notification
	40 CFR 63.11529(b)	V.12		Notification of Compliance Status
	40 CFR 63.11529(c)	V.13		Annual Compliance Certification
	40 CFR 63.11529(d) through (g)	V.14		Recordkeeping Requirements

V.1 For Emission Point AA-000 (Entire Facility), the permittee shall submit all required performance testing results no later than 60 days from the actual performance test. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.2 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the natural gas usage limitations and recordkeeping requirements for the previous consecutive 12-month period of the federally enforceable permit herein and for demonstrating that good combustion practices were implemented. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.3 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the Silicon production limitation for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuanace Date)

V.4 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the facility wide and individual BACT limits for NOx, CO, SO2, VOC, PM/PM10/PM2.5, HAP, and GHG (as CO2e) for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.5 For Emission Point AA-100 (Raw Material Receiving and Handling Operations), AA-301 (Silicon Grinding and Milling), AA-403 (Slag Handling and Storage), AA-402 and AA-402a (Unpaved Roads and Paved Roads and Plantwide Transport of Fugitive Emisisons) and AA-404 (Silica Fume Silo), the permittee shall submit semi-annual reports certifying that the permittee implemented and followed its Dust Control Plan for minimizing PM/PM10/PM2.5 emissions for the previous consecutive 12-month period for demonstrating compliance with the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.6 For AA-100 (Raw Material Receiving and Handling Operations), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the Material Throughput Rate Limitation for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.7 For AA-201 (Submerged Arc Furnaces), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the NOx, CO, and SO2 emission rates for the previous consecutive 12-month period of the federally enforceable permit herein, utilizing the CEMS technology data as described and required monitoring in Section IV. If this data is unavailable then the data of the contingency plan will be used to demonstrate compliance so that the permittee can demonstrate its emission rate for these pollutants at any given time to the MDEQ for demonstrating compliance with the individual BACT emission limits.

V.8 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the VOC and PM/PM10/PM2.5 emission limitations for the previous consecutive 12-month period of the federally enforceable permit herein. The permittee shall utilize performance test data and/or operational range data from the performance test and any other data for demonstrating compliance with the emission limitation. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.9 For Emission Point AA-201 (Submerged Arc Furnace), the permitte shall comply with 40 CFR 60, Subpart Z and submit a written report of any product change to the MDEQ no later than 30 days after implementation of the product change. (Ref.: 40 CFR 60.264(c))

V.10 For Emission Point AA-501 (Emergency Generators), the permitee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the NOx, CO, SO2, VOC, PM/PM10/PM2.5 emission limitations of the federally enforceable permit herein for the previous consecutive 12-month period and is using Ultra Low Sulfur Diesel (ULSD) Fuel. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.11 For Emission Point AA-000 (Entire Facility), the permittee shall notify the MDEQ no later than 120 days following startup of the affected source that the permitee is subject to 40 CFR 63 - Subpart YYYYYY as specified by 40 CFR CFR 63.11529(a). (Ref.: 40 CFR 63.11529(a))

V.12 For Emission Point AA-000 (Entire Facility), the permittee shall submit a Notification of Compliance Status within as required by 40 CFR 63.11529(b). This notification must include the following:

(a) The results of Method 22 (appendix A-7 of 40 CFR part 60) test for VE as required by 40 CFR 63.11528(a);

(b) If the permittee has installed a bag leak detection system, documentation that the system satisfies the design requirements specified in 40 CFR 63.11527(a)(3) and that the permittee has prepared a site-specific monitoring plan that meets the requirements specified in 40 CFR 63.11527(a)(5);

(c) The results of the Method 9 (appendix A-4 of 40 CFR part 60) test for building opacity as required by 40 CFR 63.11528(a).

(Ref.: 40 CFR 63.11529(b))

V.13 For Emission Point AA-000 (Entire Facility), the permittee shall comply with 40 CFR 63.11529(c) and submit an annual certification of compliance according to the following:

(a) The results of any daily or weekly visual monitoring events required by 40 CFR 63.11527(a)(1) and (b)(1), alarm-based visual monitoring at sources equipped with bag leak detection systems as required by 40

CFR 63.11527(a)(4), or readings outside of the operating range at sources using CPMS on wet scrubbers required by 40 CFR 63.11527(b)(4).

(b) The results of the follow up Method 22 (appendix A-7 of 40 CFR part 60) tests that are required if VE are observed during the daily or weekly visual monitoring, alarm-based visual monitoring, or out-of-range operating readings as described in paragraph (a) of this section.

(c) The results of the Method 22 (appendix A-7 of 40 CFR part 60) or Method 9 (appendix A-4 of 40 CFR part 60) tests required by 40 CFR 63.11528(b) and (c), respectively.

(d) If the permittee operates a bag leak detection system for a fabric filter or a CPMS for a wet scrubber, submit annual reports according to the requirements in 40 CFR 63.10(e) and include summary information on the number, duration, and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero and span or other calibration checks, if applicable).

V.14 For Emission Point AA-000 (Entire Facility), the permittee shall keep records as specified in 40 CFR 63.11529(d) through (g) as follows for demonstrating complying with the Recordkeeping Requirements of 40 CFR 63-Subpart YYYYYY:

(a) The permittee shall keep the records specified in paragraphs (a)(1) through (a)(2) of this section.

(1) As required in 40 CFR 63.10(b)(2)(xiv), the permittee shall keep a copy of each notification that the permittee submitted to comply with this subpart and all documentation supporting any Initial Notification, Notification of Compliance Status, and annual compliance certifications that you submitted.

(2) You shall keep the records of all daily or weekly visual, Method 22 (appendix A-7 of 40 CFR part 60), and Method 9 (appendix A-4 of 40 CFR part 60) monitoring data required by 40 CFR 63.11527 and the information identified in paragraphs (a)(2)(i) through (a)(2)(v) of this section.

(i) The date, place, and time of the monitoring event;
(ii) Person conducting the monitoring;
(iii) Technique or method used;
(iv) Operating conditions during the activity; and
(v) Results, including the date, time, and duration of the period from the time the monitoring indicated a problem (e.g., VE) to the time that monitoring indicated proper operation.

(b) The permittee's records must be in a form suitable and readily available for expeditious review, according to 40 CFR 63.10(b)(1).

(c) As specified in 40 CFR 63.10(b)(1), The permittee shall keep each record for 5 years following the date of each recorded action.

(d) The permittee shall keep each records onsite for at least 2 years after the date of each recorded action according to 40 CFR 63.10(b)(1). The permittee shall keep the records offsite for the remaining 3 years.

(Ref.: 40 CFR 63.11529(d) through (g))

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Air Dispersion Modeling Protocol in Support of Proposed Silicon Manufacturing Facility in Tishomingo County, Mississippi

5 July 2013

MISSISSIPPI
SILICON

Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
50 Industrial Drive
Burnsville, MS 38847

K/J Project No. 1341008*00

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Section 1: Introduction to Project

Mississippi Silicon, Inc. (MS Silicon) is proposing to construct a new silicon manufacturing facility (the Project) in Tishomingo County, Mississippi (near Burnsville, Mississippi) (Figure 1). An application for an air permit to construct the Project under the Prevention of Significant Deterioration (PSD) program will be submitted to the Mississippi Department of Environmental Quality (MDEQ) under separate cover during July 2013. This protocol is hereby being submitted to the MDEQ to obtain confirmation that the methodology to be used to perform the air quality impact analysis required under the Prevention of Significant Deterioration (PSD) Air Permit Program is acceptable to the MDEQ.

The Project is proposed to be constructed in an area which is in compliance with all National Ambient Air Quality Standards (NAAQS) and triggers the requirements of PSD review. The air quality impact analysis required under PSD review will be performed for emissions of the following criteria air pollutants associated with the project:

- Oxides of Nitrogen (NO_x);
- Carbon Monoxide (CO);
- Sulfur Dioxide (SO_2);
- Particulate Matter less than 10 microns in aerodynamic diameter (PM_{10});
- Particulate Matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$); and
- Volatile Organic Compounds (VOC) – Conversion to Ozone (O_3).

This document presents the air dispersion modeling protocol which will be followed to demonstrate that the plant will be in compliance with applicable state and federal air quality standards using the AERMOD dispersion model, US EPA's recommended air dispersion model. An air dispersion modeling report will be prepared documenting the procedures used to perform the air dispersion modeling and the results of the modeling. The report may be submitted either under same or separate cover from the application for an air permit to construct the Project.

Kennedy/Jenks Consultants (Kennedy/Jenks), on behalf of MS Silicon is requesting that the MDEQ review this protocol and provide written confirmation that the methodology to be utilized to perform the air quality impact evaluation in support of the PSD permitting process is acceptable to the MDEQ.

Section 2: Applicable Air Quality Regulations

In order to be issued an air permit to construct the new plant under the PSD program, it must be demonstrated that emissions of regulated air pollutants from the plant will not cause or contribute to a violation of the ambient air quality standards for Mississippi, NAAQS, or PSD increments. Additionally, it must be determined whether or not the monitoring de minimis levels can be achieved, thus satisfying the requirement to allow for an exemption from measuring ambient air concentration levels at the proposed facility site. Air dispersion modeling will be utilized to achieve these goals.

2.1 Ambient Air Quality Standards and PSD Increments

Air dispersion modeling will demonstrate whether or not one year of pre-construction monitoring data must be submitted for the applicable regulated criteria air pollutants by comparing predicted concentrations due to regulated air pollutant emissions from the Project with the Significant Monitoring Concentrations (SMCs). If the Project impacts are below the SMCs, the Project is assumed to be exempt from any pre-construction, as well as post-construction requirements under the PSD program.

The section of this protocol "Background Concentration Included in the NAAQS Compliance Demonstration" includes information on ambient air monitoring being performed in the area of the Project. This data has been gathered for the purpose of determining whether emissions of PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO and VOC from the Project might cause or contribute to a violation of the NAAQS or PSD Increments and is assumed to satisfy the pre-construction monitoring requirement should the modeled impacts of the Project exceed any applicable SMC.

Section 3: Selected Air Dispersion Model for the Project

The most recent version of AERMOD View (Version 8.2.0), developed by Lakes Environmental Software will be utilized for this project. AERMOD View incorporates the U.S. EPA regulatory models AERMOD, ISCST3 and ISC-PRIME, developed by The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC), into a single interface. Regulatory default options available in the model will be used for the compliance demonstrations.

AERMET View will be used to prepare the input for AERMOD View. The output from AERMOD View will be processed by POST View which provides a graphical interface with geographic information system (GIS) capabilities to enhance the AERMOD View model and aid the user with organizing and evaluating AERMOD View output files. The U.S. EPA's approved regulatory AERMOD code which is used to predict ambient concentrations is unaltered by AERMOD View and accompanying software packages.

The AERMOD View model family consists of several supporting pre-processor and post-processed models in addition to those mentioned above. The following list summarizes the versions of AERMOD VIEW family software that will be used for this air dispersion modeling analysis:

- AERMOD View 8.2.0;
- AERMET View 8.2.0;
- Building Profile Input Program for Prime (BPIPPRM) Version 04274;
- AERMAP 11103;
- AERSURFACE 13016; and
- POST View 8.2.0;

Section 4: Model Input and Support Data

Several data elements are required as input into to support the dispersion model AERMOD View, including:

- Representative hourly meteorological data;
- Potential points of predicted impacts, referred to as receptor points; and
- Terrain elevations for each individual receptor point.

Each of these data elements are discussed in the subsequent sections of this protocol.

4.1 Meteorological Data Selection and Pre-processing

MDEQ provides AERMOD View-ready meteorological (met) data sets consisting of five years of met data on their web site at the following url:

http://www.deq.state.ms.us/MDEQ.nsf/page/epd_AERMET_Preprocessedmetdata?OpenDocument

The North East Region met data set with surface data from the Tupelo Regional Airport and upper air data from Jackson provided by MDEQ is considered representative of the Project site. The met data was processed with AERMET View. The most recent five years of the met data, 1991 through 1995, will be used for this air dispersion modeling project.

4.2 Coordinate System and Receptor Network

The AERMOD model objects will use the North American Datum of 1983 (NAD83).

The receptor grid will be designed to identify the maximum points of air quality impact due to the Project and consisted of receptors extending at least 10 kilometers from the Project site. The ambient air boundary is defined by features which preclude public access from the Project site. Receptors will be closely spaced (50 meters) along the Project site's ambient air boundary to identify the influence of aerodynamic building downwash. The following receptor spacing will be used for the receptor grid:

- 50-meter spacing along the ambient air boundary of the Project site;
- 100-meter spacing from the Project fence line to one kilometer out from the Project site;
- 200-meter spacing from one kilometers to two kilometers from the Project site;
- 500-meter spacing from two kilometers to five kilometers from the Project site;
- 1,000-meter spacing from five kilometers to ten kilometers from the Project site; and
- 2,000-meter spacing from ten kilometers to twenty kilometers from the Project site.

4.3 Terrain Data Selection and Pre-processing

Terrain data will be assigned to the receptor networks using the latest version of AERSURFACE, a utility in AERMET View, and national elevation data (NED) files at 1-arc second resolution obtained from the United States Geological Survey (USGS) seamless data warehouse server. The elevation of buildings and sources on the site will be based upon the planned finished grading of the site.

Section 5: Project Emission Inventory

The emission inventory of the Project will be based on the potential to emit emission rates provided in the PSD air permit application. The inventory will be described in detail and provided with detailed backup calculations in the air permit application.

Consistent with the guidance in the memo "Additional Clarification Regarding the Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" (March 1, 2011 U.S. EPA Office of Air Quality Planning and Standards), the emissions of emergency and limited use equipment may be eliminated from the emission inventory. This guidance requires that compliance demonstrations "address emission scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly" to the statistical form for the NAAQS of concern.

For purposes of this Project, potential impacts from any emergency generators and fire pumps will not be included in the air quality impact evaluation for all criteria air pollutants being evaluated in the air quality impact evaluation, since the intended use of this emergency equipment will be limited, which would include 1 to 2 hours of actual use per month for testing purposes. The memorandum identified above for NO_2 is also being applied to other criteria air pollutants being evaluated from emergency equipment associated with this project.

Section 6: Determination of the Significance of Project Contributions to Ambient Air Concentrations

The inventory of Project emissions will be modeled, and the predicted ambient air concentrations will be compared with the PSD Class II SILs. If the predicted concentrations are less than the SILs, the project is demonstrated to not cause or contribute to a violation of the NAAQS or PSD Class II Increments. If predicted concentrations exceed the SILs, further modeling is required to demonstrate that the project will not cause or contribute to a violation of the NAAQS or PSD Class II Increments. The significant impact area (SIA) is defined as the set of receptors at which predicted concentrations due to emissions from the Project are predicted to equal or exceed the SIL. Table 1 provides a summary of applicable SILs.

Section 7: Determination of Requirement for Pre-Construction Monitoring

The inventory of Project emissions will be modeled, and the predicted ambient air concentrations will be compared with the SMCs. If the predicted concentrations are less than the SMCs, the Project will be exempt from the requirements to conduct pre or post construction monitoring under the PSD program. Table 2 provides a summary of the applicable SMCs. The statistical form of the modeled concentration is based on a 5-year National Weather Service met data set.

Section 8: Multisource Impact Analysis for Demonstration of Compliance with the NAAQS

Should any SIL be exceeded due to regulated air pollutant emissions from the Project, a multisource impact analysis will be required to demonstrate that the Project will not cause or contribute to a violation of the NAAQS. The multisource demonstration will include – in addition to regulated air pollutant emissions from the project – emissions of regulated air pollutants from other Non-Project sources in the area within the modeled source inventory and a background concentration based on representative ambient monitoring data. Table 3 provides a summary of the applicable NAAQS. The statistical form of the modeled concentration is based on a 5-year National Weather Service met data set.

8.1 Inventory of Non-Project Sources Included in the NAAQS Compliance Demonstration

The inventory of Non-Project sources to be included in the NAAQS compliance demonstration will be requested from MDEQ for sources located in Mississippi, Alabama Department of Environmental Management (ADEM) for sources located in Alabama and Tennessee Department of Environment and Conservation for sources located in Tennessee. The inventory will include all permitted sources within 50 kilometers of the Project's SIA for each applicable criteria pollutant with allowable emission rates.

As part of this protocol the applicant formally requests that the MDEQ provide emission inventories for existing sources within a distance of 75 kilometers from the City of Burnsville, located in Tishomingo County, MS.

The "North Carolina 20D Rule" (20D Rule) may be applied by the following procedure to the inventory of Non-Project sources to screen out sources which are not expected to cause a significant concentration gradient:

1. Sources within the SIA will not be screened out of the inventory
2. The distance "D" for each source is defined as the distance in kilometers from (a) the source being screened to the nearest edge of the SIA for annual average analyses, and (b) the source being screened to the Project site for short-term (24-hour or less) average analyses.
3. Non-Project source emissions "Q" are defined as the sum of allowable emissions for each facility in tons/year.
4. Non-Project sources with Q/D ratio less than 20 are screened out of the inventory of Non-Project sources and not included in the modeling for the multisource impact analysis for demonstration of compliance with the NAAQS.

8.2 Background Concentration Included in the NAAQS Compliance Demonstration

The NAAQS compliance demonstration for each pollutant will be based on a Tier 1 screening method which includes a background concentration for each pollutant. The background concentration will equal the most recent NAAQS design concentration from the nearest representative monitor. The background concentration and modeled concentration from the multisource impact analysis will be summed and compared with the NAAQS in the Tier 1 screening method. The statistical form of the concentration will be based on the three most recent complete years of monitoring data (2010-2012) at the monitors.

Monitor data for determination of the background concentrations will be obtained from several sources including the following:

- Downloadable yearly raw data sets at the Air Quality System (AQS) Data Mart (http://www.epa.gov/ttn/airs/airsaqs/detaildata/downloadaqsdata.htm)
- MDEQ Annual Air Quality Data Summary Reports (http://www.deq.state.ms.us/MDEQ.nsf/page/Air_CriteriaandHazardousAirPollutantMonitoring?OpenDocument)
- State of Alabama Ambient Air Monitoring 2011 Consolidated Network Review (http://www.adem.state.al.us/programs/air/airquality/2011AmbientAirPlan.pdf)

Kennedy/Jenks is requesting that the MDEQ provides appropriate background concentrations to be used for this air permitting process.

Section 9: Multisource Impact Analysis for Demonstration of Compliance with the PSD Class II Increments

Should any SIL be exceeded due to emissions from the Project, a multisource impact analysis will be required to demonstrate that the Project will not cause or contribute to an exceedance of any PSD Class II Increment. The multisource demonstration will include – in addition to emissions from the project – emissions from other Non-Project sources in the area within the modeled source inventory. Table 4 provides a summary of the applicable PSD Class II Increments. The statistical form of the modeled concentration is based on a 5-year National Weather Service met data set.

9.1 Inventory of Non-Project Sources Included in the PSD Class II Increment Compliance Demonstration

The proposed project will most likely trigger the minor source baseline date, thus will be the only increment consuming emission source for criteria air pollutants from this project for this county (baseline dates have not yet been defined for this county).

Section 10: Pollutant Specific Considerations

10.1 NO_x and NO_2 Tiered Screening Analysis

The applicant proposes to use a Tier 2 screening analysis for demonstrating compliance with the NO_2 NAAQS in which the ambient ratio of NO_2 to NO_x is 0.80 for the 1-hour averaging period and 0.75 for the annual averaging period. The assumptions of Tier 2 should be accepted without further justification per the recommendations of the EPA Office of Air Quality Planning and Standards memo "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" issued March 1, 2011. The Tier 2 approach will be implemented by modeling NO_x emission rates and scaling the predicted 1-hour concentrations by a factor of 0.80 and the predicted annual concentrations by a factor of 0.75.

If the applicant is unable to demonstrate compliance with the NO_2 NAAQS using the Tier 2 screening analysis, the applicant may request the use of a Tier 3 screening analysis based on the Ozone Limiting Method (OLM) or Plume Volume Molar Ratio Method (PVMRM) for the compliance demonstration. An additional modeling protocol which details the implementation of the Tier 3 screening analysis will be submitted to MDEQ if such an analysis is to be performed.

10.2 PM_{10} and $PM_{2.5}$ Filterable and Condensable Portions

The emission inventories of PM_{10} and $PM_{2.5}$ from the Project will include both the filterable and condensable portions of PM_{10} and $PM_{2.5}$ emissions.

10.3 PM_{10} and $PM_{2.5}$ Precursors

The emission inventories of PM_{10} and $PM_{2.5}$ from the Project will include only direct emissions of PM_{10} and $PM_{2.5}$. Formation of PM_{10} and $PM_{2.5}$ in the atmosphere due to emissions of precursor chemicals will not be considered (except to the extent which precursor emissions form particulate matter quantified as condensable particulate matter, which is included in the emission inventory as direct emissions of PM_{10} and $PM_{2.5}$). This approach is consistent with current EPA policy since no formal guidance or methodology exists for addressing precursors.

Section 11: PSD Class I Screening Analysis

The Project site is located approximately 135 kilometers from the Sipsey Wilderness Area (Sipsey) which is a PSD Class I Area. Impacts to Sipsey due to emissions from the Project should be addressed due to the proximity of the Project to Sipsey. Impacts to Sipsey will be analyzed using the following initial screening criteria recommended in "Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase I Report – Revised (2010)" (Natural Resource Report NPS/NRPC/NRR-2010/232):

1. Define the Project emissions "Q" as the sum of annual potential emissions (assuming 8,760 operating hours) of SO_2, NO_x, PM_{10}, and H_2SO_4 in tons per year.
2. Define the distance "D" as the distance between the project site and the nearest edge of the PSD Class I Area (Sipsey) in kilometers.
3. The Project is considered to have negligible impacts with respect to Class I Air Quality Related Values (AQRVs), including PSD Class I Increments and visibility impairment, if the ratio of Q/D is less than 10. No further analysis, such as dispersion modeling, is required in this case.
4. If the project ratio of Q/D is greater than 10, Kennedy/Jenks will work with the MDEQ/Federal Land Manager to define the appropriate analysis to be performed.

Section 12: Ozone Air Quality Impact Evaluation

The proposed project will have potential emissions of VOC in excess of 100 tons/year. Subsequently, under the PSD program, any project with potential emissions of VOC exceeding 100 tons/year is subject to the requirement to conduct an air quality impact evaluation.

EPA has not established a standard approach for performing an air quality impact evaluation for emissions of VOC and its effect on ozone air quality. For purposes of this project, we will be utilizing an approach previously used in support of other PSD permitting projects in EPA Region IV. This approach will involve using technical data developed in support of the Atlanta, Georgia ozone SIP. This data identifies the change in ozone air quality that will occur based on the amount of VOC/NO_x emissions introduced into the atmosphere on a ton/year basis. Essentially, a factor has been developed from this SIP process that identifies the change in ozone concentration (ppb or ppm) based on the total combined increase in VOC and NO_x emissions in tons/year.

The resultant change in ozone concentration ill then be multiplied by the representative ozone background concentration to demonstrate the resultant concentration will be below the 8-hour ozone NAAQS.

Table 1: Summary of Applicable PSD Class II SILs

Pollutant	Averaging Period	Class II SIL (ug/m^3)	Statistical Form of Modeled Concentration (At Each Receptor)
PM_{10}	24-hour	5	Highest first high of the 5 years
	Annual	1	Highest of the 5 years
$PM_{2.5}$	24-hour	1.2	Average of the highest from each year
	Annual	0.3	Average of the highest from each year
NO_2	1-hour	7.52	Average of the highest maximum daily 1-hour concentration from each year
	Annual	1	Highest of the 5 years
SO_2	1-hour	7.8	Average of the highest maximum daily 1-hour concentration from each year
	3-hour	25	Highest first high of the 5 years
	24-hour	5	Highest first high of the 5 years
	Annual	1	Highest of the 5 years
CO	1-hour	2,000	Highest first high of the 5 years
	8-hour	500	Highest first high of the 5 years

Table 2: Summary of Applicable SMCs

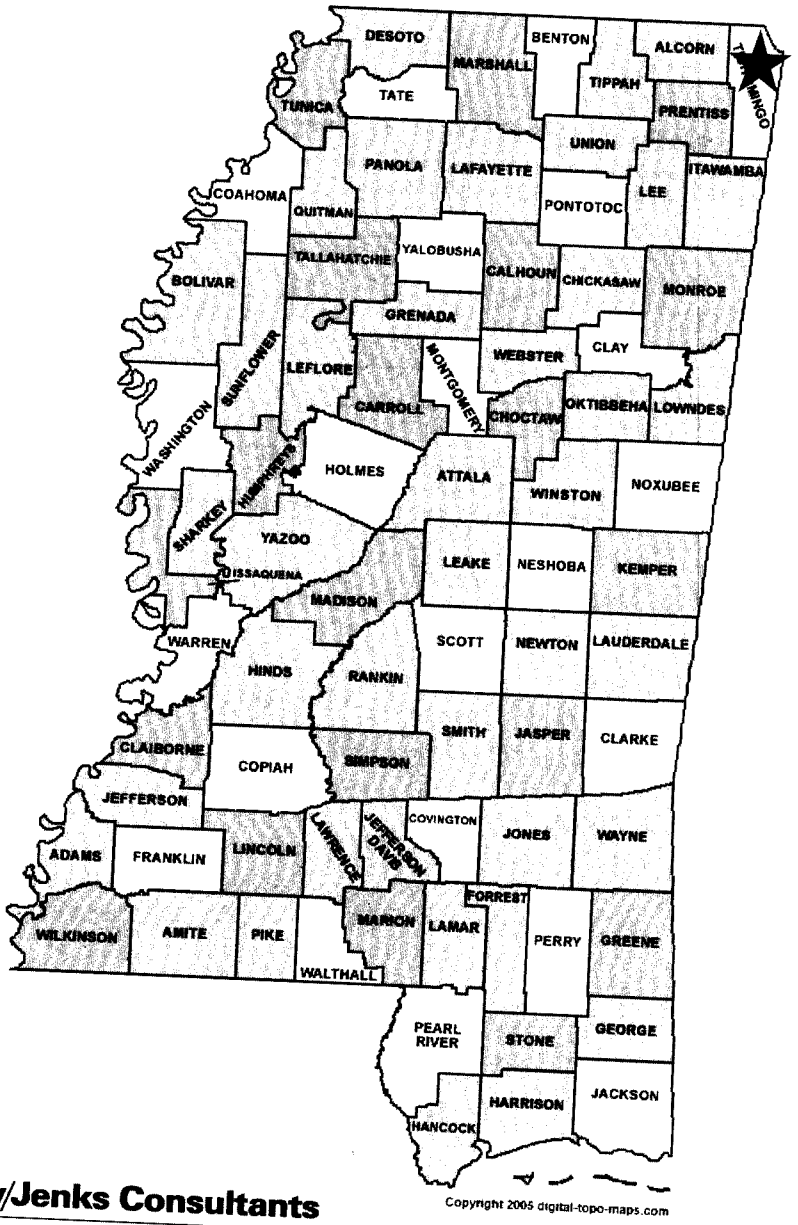
Pollutant	Averaging Period	SMC (ug/m^3)	Statistical Form of Modeled Concentration (At Each Receptor)
PM_{10}	24-hour	10	Highest first high of the 5 years
$PM_{2.5}$	24-hour	4	Average of the highest from each year
NO_2	Annual	14	Highest of the 5 years
SO_2	24-hour	13	Highest first high of the 5 years
CO	8-hour	575	Highest first high of the 5 years

Table 3: Summary of Applicable NAAQS

Pollutant	Averaging Period	NAAQS (ug/m^3)	Statistical Form of Modeled Concentration (At Each Receptor)
PM_{10}	24-hour	150	Sixth highest over 5 years (the NAAQS is not to be exceeded more than once per year on average)
	Annual	--	--
$PM_{2.5}$	24-hour	35	Average of the eighth highest (98'th percentile) from each year
	Annual	15	Average of the highest from each year
NO_2	1-hour	188	Average of the eighth highest (98'th percentile) maximum daily 1-hour concentration from each year
	Annual	100	Highest of the 5 years
SO_2	1-hour	196	Average of the fourth highest (99'th percentile) maximum daily 1-hour concentration from each year
	3-hour	1,300	Highest of the second high from each of the 5 years
	24-hour	365	Highest of the second high from each of the 5 years
	Annual	80	Highest of the 5 years
CO	1-hour	40,000	Highest of the second high from each of the 5 years
	8-hour	10,000	Highest of the second high from each of the 5 years

Table 4: Summary of Applicable PSD Class II Increments

Pollutant	Averaging Period	PSD Class II Increment (ug/m^3)	Statistical Form of Modeled Concentration (At Each Receptor)
PM_{10}	24-hour	30	Highest of the second high from each of the 5 years
	Annual	17	Highest of the 5 years
$PM_{2.5}$	24-hour	9	Highest of the second high from each of the 5 years
	Annual	4	Highest of the 5 years
NO_2	Annual	25	Highest of the 5 years
SO_2	3-hour	512	Highest of the second high from each of the 5 years
	24-hour	91	Highest of the second high from each of the 5 years
	Annual	20	Highest of the 5 years



★ Location of Proposed Pla

Figure 1. Map of Mississippi Counties
Proposed Plant

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
July 2013

Kennedy/Jenks Consultants
Engineers & Scientists

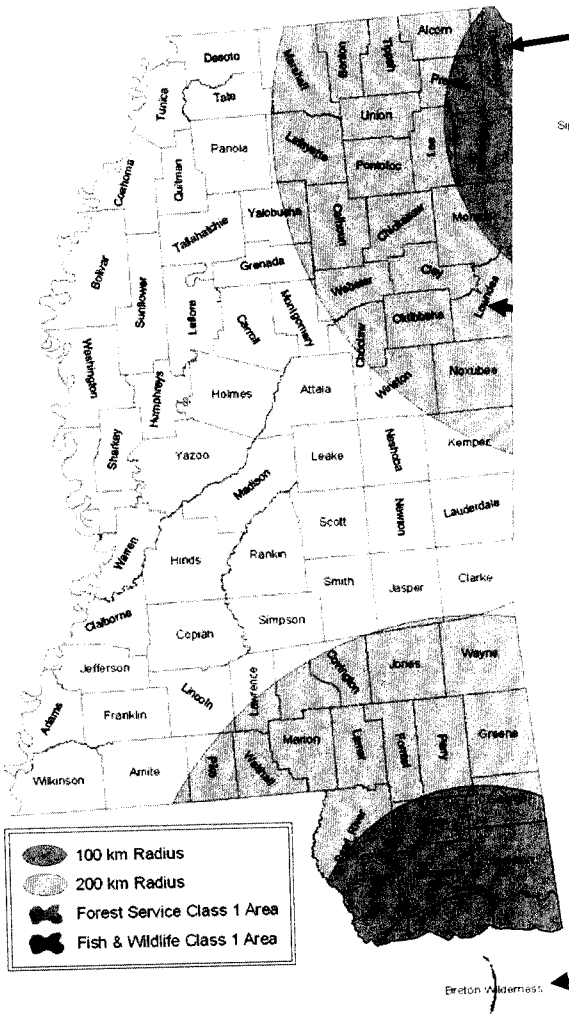


Figure 2. Project Location in Relation

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
July 2013

Kennedy/Jenks Consultants
Engineers & Scientists

Air Quality Analysis in PSD Permitting

PURPOSE OF THE AIR QUALITY ANALYSIS

- Demonstrate new emissions will not cause or contribute to a violation of a National Ambient Air Quality Standard (NAAQS)
- Demonstrate new emissions will not cause or contribute to a violation of any Prevention of Significant Deterioration (PSD) increment
- Assess the impacts of non-criteria NSR Regulated Pollutants (*e.g.,* GHGs)

GENERAL OVERVIEW

- Identify Pollutants Requiring Air Quality Impact Analysis
  - Through the applicability analysis
- Develop Pollutant-Specific Emission Information
- Perform Initial Air Quality Impact Modeling of Proposed Source
  - Impacts < PSD Significant Impact Levels (SIL) then no further modeling is required
  - Impacts > PSD SILs then Refined Cumulative PSD Increment and NAAQS analyses are required
- Perform Additional Impact Assessment
  - Class I Area AQRV (coordinate with the Federal Land Manager)
  - Class II Area Visibility
  - Growth, Soils, and Vegetation Impacts

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

- Maximum Concentration "Ceilings" designed to...
  - Protect Public Health (Primary)
  - Protect Public Welfare (Secondary)
- Exposure is Pollutant Specific
  - Short-Term Averages (*e.g.,* 1-hour NO_2 or SO_2 NAAQS)
  - Long-Term Averages (*e.g.,* Annual NO_2 or $PM_{2.5}$ NAAQS)
  - NAAQS (Criteria) Pollutants: SO_2, PM (PM_{10}/$PM_{2.5}$), and NO_2 [see NAAQS & PSD Tables Attached)

PSD INCREMENTS

- Maximum allowable increase in air concentration over a baseline value designed to...
  - Ensure there is no significant deterioration to the NAAQS
  - NAAQS (Criteria) Pollutants: SO_2, PM (PM_{10}/$PM_{2.5}$), and NO_2
- Class I and Class II Areas

  PSD Increments vary depending on classification [see NAAQS & PSD Tables Attached]
  - Class I areas are designed to be "pristine" (*e.g.,* national wilderness areas)

Air Quality Analysis in PSD Permitting

AIR QUALITY ASSESSMENT (Key Elements)

- Emission Estimates for Models
  - Emission Rates for each pollutant
  - Exit Parameters (*i.e.,* stack height, diameter, temperature, velocity, etc...)
  - Emission Source Location (UTM or Lat/Long)
  - Surrounding Plant and Topographic features
- Model Selection
  - Screening Models for Preliminary Analysis (proposed source emissions only)
  - Refined Models for **Cumulative Analysis** (see below for additional details)
- Meteorological Data Selection
  - Meteorological data must be spatially and climatologically representative of the area of interest
  - Meteorological data must characterize the transport and dispersion conditions
  - At least one year of site-specific meteorological data is desirable
  - Five (5) years of National Weather Service (NWS) data
  - Meteorological data monitoring may be needed
- Receptor Grid Selection
  - Required discrete receptors locations such as...
    - Property fence line
    - Class I area boundaries
    - Bodies of water
    - Roadways
    - Areas that are accessible to public even though not public property
    - Within the significant impact area (*e.g.,* 50 km around source)
  - **Controlling concentrations to 100-m grid resolution**
- Cumulative Impact Modeling
  - NAAQS modeling
    - Model proposed source emissions
    - **Nearby** sources must be modeled (at **Allowable** emission levels)
    - Monitored "background" concentrations are added to modeled values - Other non-modeled sources accounted for in air quality monitoring data ("background" concentrations)
  - PSD modeling (Increment)
    - Model PSD increment affecting sources only
    - Model proposed source emissions
  - Compliance is demonstrated for each applicable pollutant
    - A permit can only be issued if it demonstrates the proposed source will not **cause or contribute** to any modeled NAAQS or PSD increment violation

Re: Fw: Mississippi Silicon, Burnsville, MS
Trudy Fisher to: Richard Harrell 08/21/2013 12:18 PM

lets both call him back. yes, please do

Richard Harrell Would you like me to call back Sen Brown? Rich... 08/21/2013 10:49:45 AM

From: Richard Harrell/EPD/OPC/DEQ
To: Trudy Fisher/Admin/DEQ@DEQ,
Cc: Jill Bailey/Admin/DEQ@DEQ
Date: 08/21/2013 10:49 AM
Subject: Fw: Mississippi Silicon, Burnsville, MS

Would you like me to call back Sen Brown?

Richard Harrell, P.E., BCEE
Director, Office of Pollution Control
Mississippi Dept. of Environmental Quality
Office: 601.961.5100
Fax: 601.961.5703
---- Forwarded by Richard Harrell/EPD/OPC/DEQ on 08/21/2013 10:49 AM ----

From: Harry Wilson/EPD/OPC/DEQ
To: Richard Harrell/EPD/OPC/DEQ@DEQ,
Cc: Jill Bailey/Admin/DEQ@DEQ, Marc Wyatt/EPD/OPC/DEQ@DEQ
Date: 08/21/2013 10:06 AM
Subject: Mississippi Silicon, Burnsville, MS

FYI.

Senator T. Brown has been leaving messages with Trudy on the Mississippi Silicon project.

Bonnie is working on it and it is PSD. Received on August 16th.

It is her top 2 to do list so she is very active in the review.

Harry M. Wilson, P.E., DEE, Chief
Environmental Permits Division
Mississippi Department of Environmental Quality
P.O. Box 2261
Jackson, Mississippi 39225
Phone(601) 961-5073
Fax(601) 961-5703

Re: Senator Terry Brown
Trudy Fisher to: Richard Harrell 02/05/2014 03:26 PM

He wants me to call him back in the morning so please see what you can find out for me

Sent from my iPhone

On Feb 5, 2014, at 3:01 PM, "Richard Harrell" <Richard_Harrell@deq.state.ms.us> wrote:

> Dont know. Staff requested meeting with me for Friday about site. I will find out and let you know something before then and let you know. I know they were still having trouble with their Air modeling and EPA had not fully signed off/agreed to what they submitted but thought it was on progress to get resolved.

Richard Harrell, P.E., BCEE
Director, Office of Pollution Control
Mississippi Dept. of Environmental Quality
Office: 601.961.5100
Fax: 601.961.5703

Trudy Fisher---02/05/2014 01:55:46 PM---Just called and said we are trying to shut down Mississippi Silicon in Burnsville that was announced

From: Trudy Fisher/Admin/DEQ
To: "Richard Harrell" <Richard_Harrell@deq.state.ms.us>
Cc: "Alice Perry" <Alice_Perry@deq.state.ms.us>
Date: 02/05/2014 01:55 PM
Subject: Senator Terry Brown

Just called and said we are trying to shut down Mississippi Silicon in Burnsville that was announced three weeks ago. just passing along. What's up?

Public Notice
Mississippi Environmental Quality Permit Board
P. O. Box 2261
Jackson, MS 39225
Telephone No. (601) 961-5171

Public Notice Start Date: October 24, 2013
Deadline For Comment: November 22, 2013

MDEQ Contact: Bonnie Morgan

Mississippi Silicon, LLC, located East of County Roads 210 and 365 in Burnsville, Mississippi, (740) 525-9396 (Ohio) has applied to the Mississippi Department of Environmental Quality for Issuance of a Prevention of Significant Deterioration Construction Permit: Air Ref. No. 2640-00060. The PSD Construction Permit shall satisfy the requirement for a permit to operate until the date the application for issuance of the Title V Permit to Operate is due.

The applicant's operations fall within SIC Code 3339 for the manufacturing of Primary Nonferrous Metals for the manufacturing of Silicon Metal through the mixing of quartz, coal, and wood in semi-enclosed submerged arc furnaces to produce 98% pure silicon. The Silicon is further processed in either form of Silicon Ingot or Silicon Flake. As a result of these operations, the proposed facility is subject to Compliance Assurance Monitoring (CAM), New Source Performance Standards (NSPS) Subpart Z (Ferroalloy Production), NSPS Subpart IIII (Stationary Compression Ignition Internal Combustion Engines), National Emission Standards for Hazardous Air Pollutants (NESHAP) for Area Sources Subpart YYYYYY (Ferroalloy MACT), NESHAP Subpart ZZZZ (Reciprocating Internal Combustion Engine MACT) and PSD for Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Particulate Matter (PM), Particulate Matter 10 (PM_{10}), Particulate Matter 2.5 ($PM_{2.5}$), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOCs), and Green House Gases (regulated as Carbon Dioxide equivalent (CO_2e)). PSD regulations, which set certain requirements on the permissible incremental impact on air quality and the degree of control of air contaminants, has been reviewed for compliance with those regulations. The project will be located in a PSD Class II area and the following consumption of air quality increments is predicted to occur:

Particulate Matter Less than 2.5 microns

Annual	1.94 micrograms per cubic meter or
	48.5% of the 4 micrograms per cubic meter increment.
24-Hour	7.82 micrograms per cubic meter or
	86.8% of the 9 micrograms per cubic meter increment.

Particulate Matter Less than 10 microns

Annual	3.59 micrograms per cubic meter or
	21.11 % of the 17 micrograms per cubic meter increment.
24-Hour	16.68 micrograms per cubic meter or
	55.6% of the 30 micrograms per cubic meter increment.

Sulfur Dioxide

Annual	4.79 micrograms p er cubic meter or
	23.95% of the 20 micrograms per cubic meter increment.
24-hour	26.02 micrograms per cubic meter or
	28.59% of the 91 micrograms per cubic meter increment.
3-hour	68.89 micrograms per cubic meter or
	13.45% of the 512 micrograms per cubic increment.

Nitrogen Dioxide

Annual	6.19 micrograms per cubic meter or
	24.76% of the 25 micrograms per cubic meter increment.

64456 PER20130001

The staff of the Permit Board has developed the proposed draft perm
Board by the applicant, appropriate State and Federal agencies and o
Determination, also referred to as a Statement of Basis, has been pre
making that went into the development of the permit and to provide t
government bodies a record of the technical issues surrounding issua
Determination includes the discussion of the Best Available Control
points/sources emitting pollutants subject to PSD with the constructi
the proposed limitations by the facility which was based upon this an
with these constraints and limitations proposed by the facility and in
meet all State and Federal air pollution control laws and standards.

The staff of the Permit Board is soliciting all relative information pe
public comment, to ensure that the final staff recommendation on the
Federal regulations. Public review and comment on the draft permit
element in the staff evaluation and resulting recommendation to the
been developed to ensure compliance with all State and Federal regu
information received as a result of public participation.

Persons wishing to comment upon or object to the proposed determi
writing to Bonnie Morgan at the Permit Board's address shown abov
comments received by this date will be considered in the formulation
application. A public hearing will be held if the Permit Board finds
proposed permit. The Permit Board is limited in the scope of its anal
relative to zoning or economic and social impacts are within the juri
and should be addressed to them.

Additional details about the application, including a copy of the d
Freedom of Information Act Contact at the above Permit Board ad
courtesy, for those with Internet access, a copy of the proposed
Department of Environmental Quality's website at: http://opc.de
information is also available for review at the following locations du

Mississippi Department of Environmental Quality
Office of Pollution Control
515 E. Amite St
Jackson, MS 39201

Burnsville Public Library
PO Box 188
Burnsville, MS 38833

Please bring the foregoing to the attention of persons whom you kno

STATE OF MISSISSIPPI
PHIL BRYANT
GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TRUDY D. FISHER, EXECUTIVE DIRECTOR

October 23, 2013

Burnsville Public Library
PO Box 188
Burnsville, MS 38833

Dear Librarian:

Re: Mississippi Silicon LLC
Draft Permit Public Notice
Air Ref. No.2640-00060
Tishomingo County

Enclosed is a copy of the public notice for comment on the above referenced environmental permit. Please post this notice in your library.

Also, enclosed is a copy of information pertinent to the permit. This information should be kept on hand for review by the public until November 22, 2013, after which it may be discarded. The public may photocopy all or any portion of this information, but it should not leave the library.

Finally, enclosed please find a duplication of this letter with a place for your signature and the date acknowledging your receipt of the package and your agreement to carry out our request. A self-addressed stamped envelope is enclosed for your convenience.

We are attempting to better keep the public informed of and involved in this Office's actions regarding environmental permits. Since access to the public library is so convenient for so many we hope to use these facilities as often as possible. Your cooperation in this matter is greatly appreciated.

If you have any questions, please let me know at (601) 961-5784.

Sincerely,

Bonnie Morgan
Metal and Metal Fabricators Branch
Environmental Permits Division

Enclosure
Received and
Agreed to By:_____ Title:_____ Date:_____

64456 PER20130001

MS Si PSD Permit Public Notice and Air Quality Modeling Timeline

Date	Description
8/15/2013	MS Silicon submission of permit application, including modeling results for proposed facility only
10/2/2013	Kennedy/Jenks letter response to MDEQ and USEPA questions
10/9/2013	Kennedy/Jenks submission of preliminary Class I air quality modeling results
10/10/2013	Kennedy/Jenks submission of Addendum #1, including Class II multi-source (cumulative) air quality modeling results and modeling files
10/21/2013	Preliminary determination issued by MDEQ
10/23/2013	Kennedy/Jenks response to MDEQ questions, which makes reference to additional air modeling but is conclusory rather than substantive.
10/23/2013	Draft permit and public notice (as well as notice to Affected States and FLM) issued by MDEQ
10/24/2013	Beginning of public notice period
11/22/2013	End of public notice period
11/22/2013	Kennedy/Jenks submission of Addendum #2, including revised Class I and Class II modeling results
11/25/2013	Kennedy Jenks submission of Addendum #2 modeling files
11/27/2013	Final air permit issued by MDEQ
12/16/2013	MDEQ response to USEPA

ALABAMA STATE SENATE

ALABAMA STATE HOUSE
11 SOUTH UNION - ROOM 735 - D
MONTGOMERY, ALABAMA 36130-4600

ALABAMA

Dr. Quinton T. Ross, Jr.
STATE SENATOR 26TH DISTRICT
POST OFFICE BOX 6183
MONTGOMERY, ALABAMA 36106
OFFICE: (334) 242-7880
FAX: (334) 353-8417

COMMITTEES:
VICE CHAIR:
Education
MEMBER:
Commerce, Transportation and Utilities
Tourism and Marketing
Veterans and Military Affairs

Ms. Gina McCarthy
Administrator
United States Environmental Protection Agency
Mail Code: 4101M
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Ms. McCarthy:

I write to inform you of an issue that is of utmost importance to me and the people in my district, and to ask you to take immediate action to undue a grave injustice.

On November 27, 2013, the Mississippi Department of Environmental Quality ("MDEQ") issued PSD permit no. 2640-00060 (the "Permit") to Mississippi Silicon LLC authorizing construction of a greenfield silicon metal manufacturing facility (the "New Facility") in Tishomingo County, Mississippi. Tishomingo County is immediately adjacent to Alabama.

I am informed that MDEQ did not allow the public participation required by the Clean Air Act prior to issuing the subject Permit. As you know, one of the primary purposes in enacting the PSD amendment was "to assure that any decision to permit increased air pollution in any area to which [PSD] applies is made only after careful evaluation of all the consequences of such a decision and *after adequate procedural opportunities for informed public participation in the decision-making process.*" 42 U.S.C. § 7470(5). In particular, PSD prohibits construction of a major source of air emissions "unless . . . a public hearing has been held with opportunity for interested persons . . . to appear and submit written or oral presentations on the air quality impact of such source, . . . control technology requirements, and other appropriate considerations." 42 U.S.C. § 7475(a)(2).

Here, MDEQ did not conduct a public hearing at all. I am informed that notice of the preliminary determination to issue the Permit was published in a local newspaper on October 24, 2013, but that copies of the preliminary determination summary, air quality impact summary and draft permit were not made available for inspection until October 29, 2014, at the earliest. Yet the public was given only until November 22, 2013 to submit written comments. Moreover, I understand that MDEQ did not provide the Alabama Department of Environmental Management ("ADEM") with notice of the preliminary determination until October 24, 2013, contrary to the sixty-day notice required by 42 U.S.C. § 7426(a).

In addition to being patent violations of the due process required by the Clean Air Act, MDEQ's abridgement of the public's right to participate directly threatens a significant deterioration of air quality in Alabama, as I understand the Permit and New Facility to which it pertains are problematic in a number

of respects. The following is a list of just some of the technical defects of the Permit, as I understand them:

- The Permits allows the New Facility to cause a significant and unlawful deterioration of air quality in the Sipsey Wilderness Area in Bankhead National Forest in Alabama, a Class I area where emission limits for PSD criteria pollutants are most stringent, as well as in northwestern Alabama generally; The Permit ostensibly restricts Mississippi to running only two of the four furnaces it proposes to build, yet the maximum production rates and emission rates in the Permit correlate with all four of the furnaces Mississippi Silicon LLC proposes to build operating at maximum capacity 24-hours per day, 365 days per year – a circumstance which I understand may enable Mississippi Silicon LLC to avoid full PSD review of a later increase in the number of furnaces it operates;

- The Permit allows the New Facility to cause or contribute to violations of national ambient air quality standards in Mississippi and Alabama because MDEQ allowed Mississippi Silicon LLC to perform the required air quality impact analyses with background data provided by monitoring stations that are hundreds of miles away from Tishomingo County, rather than requiring Mississippi Silicon LLC to perform and provide pre-application ambient air quality monitoring as required by the Clean Air Act;

- The Permit fails to require best available control technology ("BACT") for several emission sources at the New Facility, or to require any air pollution control at all for others;

- The Permit grossly understates the emission of Hazardous Air Pollutants ("HAPs"), in some case by 90%, and thereby improperly classifies the New Facility as a :minor" source of HAPs when it fact it will be a "major" source;

- The Permit fails to include case-by-case maximum achievable control technology requirements for HAPs, including hydrogen chloride and hydrogen fluoride.

I understand that Mississippi Silicon LLC recently announced that it has commenced or soon will commence constructing the New Facility. Under the circumstances, I ask that you exercise your authority under 42 U.S.C. § 7477 and issue an administrative order, or seek injunctive relief, as necessary to prevent or suspend construction of the New Facility until such time as MDEQ revokes and reissues the Permit, if at all, only after fully complying with the public participation and other requirements of the Clean Air Act.

Sincerely,

Hon. Quinton Ross
Alabama State Senator

cc:

Heather McTeer Toney
Regional Administrator
United States Environmental Protection Agency, Region 4
Sam Nunn Atlanta Federal Center (SNAFC)
61 Forsyth Street SW
Atlanta, GA 30303-8960

Stephen M. Lohr
Forest Supervisor
USDA Forest Service, Region 8
2946 Chestnut Street
Montgomery, AL 36107-3010

Lance R. LeFleur
Director
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, AL 36110-2400

ALABAMA STATE SENATE
ALABAMA STATE HOUSE
11 SOUTH UNION STREET, 7TH FLOOR, SUITE 734-B
MONTGOMERY, ALABAMA 36130-4600

GREG REED
SENATOR DISTRICT 5
JEFFERSON, TUSCALOOSA
WALKER AND WINSTON
PHONE (334) 242-7894
FAX (334) 353-9625

COMMITTEES:

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CHILDREN, YOUTH AFFAIRS & HUMAN RESOURCES
JOB CREATION & ECONOMIC DEVELOPMENT
SMALL BUSINESS
TOURISM & MARKETING

March 20, 2014

Ms. Gina McCarthy
Administrator
United States Environmental Protection Agency
Mail Code: 4101M
1200 Pennsylvania Avenue, N.W
Washington, DC 20460

Dear Ms. McCarthy:

I write to inform you of an issue that is of utmost importance to me and the people in the my district, and to ask you to take action to undo a grave injustice.

On November 27, 2013, the Mississippi Department of Environmental Quality ("MDEQ") issued PSD permit no. 2640-00060 (the "Permit") to Mississippi Silicon LLC authorizing construction of a Greenfield silicon metal manufacturing facility in Tishomingo County, Mississippi. Tishomingo County is immediately adjacent to Alabama.

I am informed that MDEQ did not allow the public participation required by the Clean Air Act prior to issuing the Permit. Here in Alabama, MDEQ did not conduct a public hearing at all. The preliminary determination to issue the Permit was published in a local newspaper on October 24, 2013. The public was given until November 22, 2013 to submit written comments. Moreover, I understand the MDEQ did not provide the Alabama Department of Environmental Management ("ADEM") with notice of the preliminary determination until October 24, 2013, which is contrary to your agency's required sixty day notice.

In addition to violating due process measures put into place by the Clean Air Act, MDEQ's abridgement of the public's right to participate in a matter that threatens to significantly contribute in the deterioration of air quality in Alabama.

I understand that Mississippi Silicon LLC recently announced that it soon will commence constructing the new facility. Under these circumstances I ask that your exercise your authority to revoke the Permit and only reissue after fully complying with the public participation and other requirements of the Clean Air Act.

Sincerely,

Greg J. Reed
Senator, District 5

GR/pa

cc:

Heather Mcteer Toney
Regional Administator
U. S. EPA, Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street SW

Stephen M. Lohr
Forest Supervisor
USDA Forest Service, Region
2946 Chestnut Street
Montgomery, AL 36107

Lance R. LeFleur
Director
ADEM
1400 Coliseum Blvd.
Montgomery, AL 36110

ALABAMA STATE SENATE
ALABAMA STATE HOUSE
MONTGOMERY, ALABAMA 36130-4600

ALABAMA

ROGER H. BEDFORD, JR.
STATE SENATOR 6TH DISTRICT
POST OFFICE BOX 370
RUSSELLVILLE, ALABAMA 35653
RUSSELLVILLE (256) 332-6966
MONTGOMERY (334) 242-7862

COMMITTEES:
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FINANCE AND TAXATION, EDUCATION
CONFIRMATIONS
BANKING AND INSURANCE
LEGISLATIVE BUILDING AUTHORITY
DIRECTOR, STATE LEGISLATIVE LEADERS FOUNDATION

March 19, 2014

Ms. Gina McCarthy, Administrator
United States Environmental Protection Agency
Mail Code: 4101M
1200 Pennsylvania Avenue, N.W
Washington, D.C. 20460

Dear Ms. McCarthy:

I write to inform you of an issue that is of utmost importance to me and the people in my district, and to ask you to take immediate action to undue a grave injustice.

On November 27, 2013, the Mississippi Department of Environmental Quality ("MDEQ") issued PSD permit no. 2640-00060 (the "Permit") to Mississippi Silicon LLC authorizing construction of a greenfield silicon metal manufacturing facility (the "New Facility") in Tishomingo County, Mississippi. Tishomingo County is immediately adjacent to Alabama.

I am informed that MDEQ did not allow the public participation required by the Clean Air Act prior to issuing the subject Permit. As you know, one of Congress' primary purposes in enacting the PSD amendment was "to assure that any decision to permit increased air pollution in any area to which [PSD] applies is made only after careful evaluation of all the consequences of such a decision and *after adequate procedural opportunities for informed public participation in the decision-making process*." 42 U.S.C. § 7470(5). In particular, PSD prohibits construction of a major source of air emissions "unless... a public hearing has been held with opportunity for interested persons... to appear and submit written or oral presentations on the air quality impact of such source,...control technology requirements, and other appropriate considerations." 42 U.S.C. § 7475(a)(2).

Here, MDEQ did not conduct a public hearing at all. I am informed that notice of the preliminary determination to issue the Permit was published in a local newspaper on October 24, 2013, but that copies of the preliminary determination summary, air quality impact summary and draft permit were not made available for inspection until October 29, 2014, at the earliest. Yet the public was given only until November 22, 2013 to submit written comments. Moreover, I understand that MDEQ did not provide the Alabama Department of Environmental Management ("ADEM") with notice of the preliminary determination until October 24, 2013, contrary to the sixty-day notice required by 42 U.S.C. § 7426(a).

In addition to being patent violations of the due process required by the Clean Air Act, MDEQ's abridgement of the public's right to participate directly threatens a significant deterioration of air quality in Alabama, as I understand the Permit and New Facility to which it pertains are problematic in a number of respects. The following is a list of just some of the technical defects of the Permit, as I understand them:

- The Permits allows the New Facility to cause a significant and unlawful deterioration of air quality in the Sipsey Wilderness Area in Bankhead National Forest in Alabama, a Class I area where emission limits for PSD criteria pollutants are most stringent, as well as in northwestern Alabama generally; The Permit ostensibly restricts Mississippi to running only two of the four furnaces it proposes to build, yet the maximum production rates and emission rates in the Permit correlate with all four of the furnaces Mississippi Silicon LLC proposes to build operating at maximum capacity 24-hours per day, 365 days per year – a circumstance which I understand may enable Mississippi Silicon LLC to avoid full PSD review of a later increase in the number of furnaces it operates;

- The Permit allows the New Facility to cause or contribute to violations of national ambient air quality standards in Mississippi and Alabama because MDEQ allowed Mississippi Silicon LLC to perform the required air quality impact analyses with background data provided by monitoring stations that are hundreds of miles away from Tishomingo County, rather than requiring Mississippi Silicon LLC to perform and provide pre-application ambient air quality monitoring as required by the Clean Air Act;

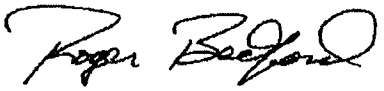
- The Permit fails to require best available control technology ("BACT") for several emission sources at the New Facility, or to require any air pollution control at all for others;

- The Permit grossly understates the emission of Hazardous Air Pollutants ("HAPs"), in some case by 90%, and thereby improperly classifies the New Facility as a "minor" source of HAPs when in fact it will be a "major" source;

- The Permit fails to include case-by-case maximum achievable control technology requirements for HAPs, including hydrogen chloride and hydrogen fluoride.

I understand that Mississippi Silicon LLC recently announced that it has commenced or soon will commence constructing the New Facility. Under the circumstances, I ask that you exercise your authority under 42 U.S.C. § 7477 and issue an administrative order, or seek injunctive relief, as necessary to prevent or suspend construction of the New Facility until such time as MDEQ revokes and reissues the Permit, if at all, only after fully complying with the public participation and other requirements of the Clean Air Act.

Sincerely,



Roger H. Bedford, Jr.
Alabama State Senate

cc:

Heather McTeer Toney, Regional Administrator
United States Environmental Protection Agency, Region 4
Sam Nunn Atlanta Federal Center (SNAFC)
61 Forsyth Street SW
Atlanta, GA 30303-8960

Stephen M. Lohr, Forest Supervisor
USDA Forest Service, Region 8
2946 Chestnut Street
Montgomery, AL 36107-3010

Lance R. LeFleur, Director
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, AL 36110-2400

IN THE CHANCERY COURT OF HINDS COUNTY, MISSISSIPPI
FIRST JUDICIAL DISTRICT

FILED
MAR 07 2014
EDDIE JEAN CARR, CHANCERY CLERK
BY _____ D.C.

GLOBE METALLURGICAL, INC. **PLAINTIFF/APPELLANT**

VS. **CAUSE NO.** G2014-297 W/4

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY **DEFENDANT/APPELLEE**

GLOBE METALLURGICAL, INC.'S
ADMINISTRATIVE APPEAL AND COMPLAINT

Globe Metallurgical, Inc. ("GMI") files this Administrative Appeal and Complaint against the Mississippi Department of Environmental Quality ("MDEQ"), and in support thereof shows the following:

Parties, Jurisdiction and Venue

1. Globe Metallurgical, Inc. is a foreign corporation.

2. MDEQ is a Mississippi state entity that may be served with process through the Office of the Attorney General of the State of Mississippi.

3. Jurisdiction in this Court is proper pursuant to Miss. Code Ann. §§ 9-5-81 and 49-17-29, and under Art. 6, § 159(a) of the Constitution of Mississippi of 1890.

4. Upon information and belief, venue is proper in this Court pursuant to Miss. Code Ann. §§ 11-11-3 and 11-45-1.

Background

5. MDEQ serves as the staff for the Mississippi Environmental Quality Permit Board ("Permit Board"), providing technical, legal, and administrative support. Miss. Code Ann. § 49-2-1, *et seq.* The Permit Board is the exclusive administrative body "to make decisions on permit issuance, reissuance, denial, modification or revocation of air pollution control and water

pollution control permits and permits required under the Solid Wastes Disposal Law of 1974 (Title 17, Chapter 17), and all other permits within the jurisdiction of the Permit Board." Miss. Code Ann. § 49-17-29(3)(a). Pursuant to section 49-17-29, the Permit Board delegated to the MDEQ Executive Director the authority to make decisions on the issuance, reissuance, denial, modification, or revocation of, *inter alia,* air pollution control permits, while retaining for itself the ability to review such permits through a formal hearing process. *See* Miss. Admin. Code §§ 11-1:4.1(C) and 11-1:4.2.

6. On August 16, 2013, Mississippi Silicon, LLC ("Mississippi Silicon") applied for a permit to construct a facility to manufacture and sell silicon metal and silica fume in Tishomingo County, Mississippi (the "Facility").

7. Permit No. 2640-00060 (the "Permit") was issued to Mississippi Silicon by MDEQ staff on November 27, 2013. *See* Exhibit 1, Permit No. 2640-00060.[1]

8. At its December 10, 2013 meeting, the Permit Board voted to note and record in its minutes the report of permit actions/certifications by staff since the November 12, 2013 Permit Board meeting. *See* Exhibit 2, December 10, 2013 Meeting.

9. During MDEQ's consideration of Mississippi Silicon's application for the Permit, the United States Environmental Protection Agency ("EPA") submitted various written comments to MDEQ. Those written comments were contained in email correspondence dated September 10, 2013 and letters dated November 14, 2013 and November 21, 2013. On December 16, 2013, MDEQ wrote to EPA in response to the EPA's comments on Mississippi Silicon's application for the Permit. *See* Exhibit 3, December 16, 2013 Letter. MDEQ's Executive Director, Trudy D. Fisher, stated therein, "I have reviewed the comments and made

[1] As discussed below, MDEQ amended the Permit after first issuing it to Mississippi Silicon. GMI is without sufficient information to determine whether the Permit attached as Exhibit 1 is the Permit in its original form or the amended version. GMI will supplement the record as necessary.

changes to both the PSD Construction Permit and the Final Determination document, which incorporates the Preliminary Determination, as a result of your comments." *Id.* The letter references material changes to the Permit. *Id.*

10. At its meeting on January 14, 2014, the Permit Board took action regarding the December 10, 2013 meeting, finding that "the minutes of the regular meeting on December 10, 2013, were approved." *See* Exhibit 4, January 14, 2014 Meeting. The Permit Board also voted to note and record in its minutes the report of permit actions/certifications by staff since the December 10, 2013 Permit Board meeting. *Id.*

11. On February 12, 2014, GMI submitted a timely request to the Permit Board that it conduct a formal hearing on the Permit (the "February 12, 2014 Request"). *See* Exhibit 5, February 12, 2014 Request.

12. In its request, GMI stated that pursuant to Miss. Admin. Code § 11-2:2.2.A, MDEQ lacked authority to issue the Permit because, among other things, Mississippi Silicon did not: (1) demonstrate that emissions from construction or operation of the proposed Facility will not cause or contribute to air pollution in excess of a maximum allowable increases for, among other things, particulate matter with aerodynamic diameter less than 2.5μm ("$PM_{2.5}$") and sulfur dioxide ("SO_2"); (2) demonstrate that emissions from construction or operation of the proposed Facility will not cause or contribute to air pollution in excess of any national ambient air quality standards ("NAAQS"), including, without limitation, the one-hour National Ambient Air Quality Standard ("NAAQS") for nitrogen dioxide ("NO_2"); (3) provide pre-construction ambient air quality monitoring data for, among other things, particulate matter with aerodynamic diameter less than 10μm ("PM_{10}"), $PM_{2.5}$, NO_2 and SO_2; or (4) demonstrate that the proposed Facility will be subject to the best available control technology. *See* Exhibit 5, February 12, 2014 Request. All of these requirements are imposed by the federal Clean Air Act, 42 U.S.C. § 7470, *et seq.*

("PSD"), and the applicable Mississippi state implementation plan (the "SIP"). GMI further stated that it expected to identify additional grounds for appeal during the hearing before the Permit Board. *Id.*

13. GMI requested that the Permit Board: (a) schedule a formal hearing at its earliest opportunity; (b) reverse its prior decision to issue the Permit and revoke the same: and (c) remand the matter of Mississippi Silicon's application for a PSD permit to MDEQ with instructions not to issue the Permit or any other permit unless and until MDEQ and Mississippi Silicon comply with all applicable requirements under PSD and the SIP. *See* Exhibit 5, February 12, 2014 Request.

14. On February 18, 2014, MDEQ responded to GMI's request, stating that MDEQ "has reviewed the applicable regulations concerning your request and determined that your request is barred because it was not timely filed." *See* Exhibit 6, February 18, 2014 Letter. MDEQ stated that "[b]ecause the staff issued the permit pursuant to its statutory [sic] delegated authority, the time period to request a hearing is governed by the Mississippi Environmental Quality Permit Board Delegation of Permitting Authority Regulations found at 11 Miss. Admin. Code Pt. 1, R. 4.3." *Id.* It stated that, pursuant to those regulations, "the time period for an aggrieved party to request a formal hearing before the Mississippi Environmental Quality Permit Board 'shall be calculated from the date of the Permit Board meeting at which the decision of the Executive Director or his delegate is accepted by the Permit Board.'" *Id.* According to MDEQ, "the Permit Board accepted [the Permit's] issuance at its December 10, 2013, meeting." *Id.* MDEQ found that since GMI did not request a formal hearing until February 12, 2014, outside the 30 day period for making such a request, the Permit "is not subject to the appeals process and is a final permit." *Id.*

15. As discussed below, MDEQ's decision is arbitrary and capricious, is beyond MDEQ's power, and violates statutory and/or constitutional rights of GMI. Accordingly, GMI requests that this Court enter an order finding that MDEQ's denial of GMI's request for a formal hearing is in violation of law, and, therefore, should be reversed.

Administrative Appeal of MDEQ's Denial of GMI's Request for a Formal Hearing Regarding the Permit

16. GMI incorporates herein by reference the foregoing paragraphs 1 through 15.

I. Standard of Review

17. In reviewing decisions of administrative agencies, the standard of review is whether the order of the administrative agency was unsupported by substantial evidence, was arbitrary and capricious, was beyond the power of administrative agency to make, or violated some statutory or constitutional right of the complaining party. *See Tillmon v. Miss. State Dep't of Health*, 749 So. 2d 1017, 1020-1021 (Miss. 1999). In other words, not only must there be substantial evidence to support the decision, the action of the agency must not be arbitrary, capricious, or beyond the agency's power.

18. "[A]n agency's interpretation of its own regulation must be overturned if so plainly erroneous or so inconsistent with either the underlying regulation or statute as to be arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." *Limbert v. Miss. Univ. for Women Alumnae Ass'n, Inc.*, 998 So. 2d 993, 1000 (Miss. 2008); *accord Sierra Club v. Miss. Envtl. Quality Permit Bd.*, 943 So. 2d 673, 679 (Miss. 2006) ("where an administrative agency's interpretation is contrary to the unambiguous terms or best reading of a statutory provision, the agency is not entitled to deference"); *Miss. State Tax Comm'n v. Lady Forest Farms, Inc.*, 701 So. 2d 294, 296 (Miss. 1997) (same). When the agency has misapprehended a controlling legal principle, no deference is due. *Univ. of Miss. Medical Center*

v. Smith, 909 So. 2d 1209, 1218 (Miss. Ct. App. 2005). An appellate court may intercede if it determines that the agency applied an incorrect legal standard. *Miss. Employment Sec. Comm'n v. Claiborne*, 872 So. 2d 698, 700 (Miss. Ct. App. 2004) (citation omitted).

II. MDEQ's Denial of GMI's Request for a Formal Hearing Should Be Reversed.

19. Mississippi Code Annotated § 49-17-29(4)(b) states that "[w]ithin thirty (30) days after the date the Permit Board takes action upon permit issuance ... , as recorded in the minutes of the Permit Board, any interested party aggrieved by that action may file a written request for a formal hearing before the Permit Board." (emphasis added).

20. In its letter denying Globe Metallurgical, Inc.'s request for a formal hearing before the Permit Board, MDEQ cites one of its regulations, which states that "[t]he time period in which an aggrieved party may file a request for a formal hearing before the Permit Board concerning a Delegated Permit action ... shall be calculated from the date of the Permit Board meeting at which the decision of the Executive Director or his delegate is accepted by the Permit Board." *See* Exhibit 6, February 18, 2014 Letter (citing MDEQ Permit Board Delegation of Permitting Authority Regulations, Miss. Admin. Code 11-1:4.3).

21. MDEQ contends that "the Permit Board accepted [the Permit's] issuance at its December 10, 2013, meeting[,]" and, because GMI did not request a formal hearing until February 12, 2014, the Permit "is not subject to the appeals process and is a final permit." *See* Exhibit 6, February 18, 2014 Letter.

22. However, the draft minutes from the December 10, 2013 meeting were not approved -- and therefore neither the minutes nor the Permit became final -- until the Board's January 14, 2014 meeting. Therefore, GMI's request for a formal hearing was timely.

23. As noted above, Section 49-17-29(4)(b) provides that an interested party aggrieved by the Permit Board's action may request a formal hearing "[w]ithin thirty (30) days

after the date the Permit Board takes action upon permit issuance ... , as recorded in the minutes of the Permit Board." The Mississippi Supreme Court has repeatedly held that public boards speak only through their minutes, and their actions are evidenced solely by entries on the minutes. *See Thompson v. Jones County Cmty. Hosp.*, 352 So. 2d 795, 796 (Miss. 1977) (citations omitted). Accordingly, Section 49-17-29(4)(b) requires, and has always been interpreted by MDEQ to require, that an aggrieved party request a formal hearing within thirty days of the date on which the Permit Board's draft minutes featuring the relevant Permit Board decision are approved and thereby become final. MDEQ's new and unprecedented interpretation of this statute in regard to GMI's request is so plainly erroneous and so inconsistent with the statutory text as to be arbitrary, capricious, an abuse of discretion, and otherwise not in accordance with law.

24. Furthermore, the Permit Board's December 10, 2013 meeting concerned only MDEQ staff actions that took place between the November 12, 2013 meeting and the December 10, 2013 meeting; upon information and belief, it did not concern or take into account the material changes to the Permit reflected in MDEQ's December 16, 2013 letter to the EPA. Accordingly, even under the interpretation of Section 49-17-29(4)(b) now purportedly used by MDEQ, the Permit Board apparently did not "take action" on such amended Permit until the January 14, 2014 meeting.

25. In addition, the Executive Director of MDEQ exceeded her authority by denying GMI's request for an evidentiary hearing in her letter of February 18, 2014. The Mississippi Code does not invest the Executive Director of MDEQ with authority to issue such a denial. Miss. Code Ann. § 49-2-13. Rather, Mississippi law provides that the Permit Board has exclusive authority to consider GMI's request for a hearing. *See* Miss. Code Ann. §§ 49-17-28 and 49-17-29(4).

26. For all of these reasons, MDEQ's denial of GMI's request for a formal hearing regarding the Permit is arbitrary and capricious, is beyond the power of MDEQ to make, and violates statutory and/or constitutional rights of GMI.

III. GMI Reserves the Right to Amend.

27. GMI's appeal and objections are based on Mississippi law and regulations. GMI reserves its legal right to amend this pleading to timely add and include any and all issues as may be raised or made evident from the documents and materials that have yet to be provided by MDEQ.

Relief Requested

WHEREFORE, PREMISES CONSIDERED, GMI seeks and hereby respectfully requests a hearing in this action as to the merits of the issues presented here, and prays that the Court declare that MDEQ's denial of GMI's request for a formal hearing in respect of the subject Permit is in violation of law and should be reversed. GMI additionally seeks such other and further relief as the Court may deem just and proper.

This the 7th day of March, 2014.

Respectfully submitted,

GLOBE METALLURGICAL, INC.

By: _____
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One of Its Attorneys

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STATE OF MISSISSIPPI AIR POLLUTION CONTROL PERMIT

AND PREVENTION OF SIGNIFICANT DETERIORATION AUTHORITY TO CONSTRUCT AIR EMISSIONS EQUIPMENT

THIS CERTIFIES THAT

Mississippi Silicon LLC
Burnsville, Mississippi
Tishomingo County

has been granted permission to construct air emissions equipment to comply with emission limitations, monitoring requirements and other conditions set forth herein. This permit is issued in accordance with the provisions of the Mississippi Air and Water Pollution Control Law (Section 49-17-1 et. seq., Mississippi Code of 1972), and the regulations and standards adopted and promulgated thereunder and under authority granted by the Environmental Protection Agency under 40 CFR 52.01 and 52.21.

MISSISSIPPI ENVIRONMENTAL QUALITY PERMIT BOARD

AUTHORIZED SIGNATURE
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

Issued: November 27, 2013 **Permit No.: 2640-00060**

EXHIBIT

"1"

PART I
GENERAL CONDITIONS

I.1. Any activities not identified in the application are not authorized by this permit.

I.2. All air pollution control facilities shall be designed and constructed such as to allow proper operation and maintenance of the facilities.

I.3. The necessary facilities shall be constructed so that solids removed in the course of control of air emissions may be disposed of in a manner such as to prevent the solids from becoming windborne and to prevent the materials from entering State waters without the proper environmental permits.

I.4. The air pollution control facilities shall be constructed such that diversion from or bypass of collection and control facilities is not needed except as provided for in Regulation APC-S-1, "Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants", Section 10.

I.5. The construction of facilities shall be performed in such a manner as to reduce both point source and fugitive dust emissions to a minimum.

I.6. The permittee shall allow the Mississippi Department of Environmental Quality Office of Pollution Control and the Mississippi Environmental Quality Permit Board and/or their representatives upon presentation of credentials:

a. To enter upon the permittee's premises where an air emission source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any air emissions.

I.7. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to:

a. Violation of any terms or conditions of this permit.

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts, or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of authorized air emissions.

I.8. Except for data determined to be confidential under the Mississippi Air & Water Pollution Control Law, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Mississippi Department of Environmental Quality Office of Pollution Control.

I.9. The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

I.10. Nothing herein contained shall be construed as releasing the permittee from any liability for damage to persons or property by reason of the installation, maintenance, or operation of the air cleaning facility, or from compliance with the applicable statutes of the State, or with local laws, regulations, or ordinances.

I.11. This permit may only be transferred upon approval of the Mississippi Environmental Quality Permit Board.

I.12. This permit is for air pollution control purposes only.

I.13. Approval to construct will expire should construction not begin within eighteen (18) months of the issuance of this permit, or should construction be suspended for eighteen (18) months.

I.14. The permittee shall notify the MDEQ in writing when construction of the facility begins within fifteen (15) days of beginning actual construction.

I.15 Upon the completion of construction or installation of an affected source, the permittee shall notify the Permit Board within thirty (30) days that construction or installation was performed in accordance with the approved plans and specifications on file with the permit board. Certification of Construction for the purposes of this permit is defined as completion of the commissioning and testing, of all of the major production lines, which allows the beginning of operations as an integrated facility.

I.16 The Permit to Construct shall be deemed to satisfy the requirement for a permit to operate until the date the application for issuance of the Title V Permit to Operate is due. The permittee shall submit an application for a Title V Permit to Operate no later than twelve (12) months after beginning operation. Beginning operation will be assumed to occur upon certification of construction, unless the permittee specifies differently in writing.

PART II
EMISSION POINT DESCRIPTION

The permittee is authorized to construct air emissions equipment for the emission of air contaminants from the Silicon Manufacturing Plant:

Emission Point	Description
AA-000	**Silicon Manufacturing Plant**
AA-100	**Raw Material Receiving, Handling and Storage Operations**
AA-101	Material Handling and Transfer to and from Coal Storage Pile
AA-101a	Conveyance of Coal to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-102	Material Handling and Transfer to and from Wood Storage Pile
AA-102a	Conveyance of Wood to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-102b	Wood Chipper
AA-103	Material Handling and Transfer to and from Quartz Storage Pile
AA-103a	Conveyance of Quartz to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-104	Material Handling and Transfer to and from Limestone Storage Pile
AA-105	Storage Piles Processing (i.e., Bulldozing)
AA-106	Wind Erosion on Coal, Wood and Quartz Storage Piles
AA-200	**Silicon Manufacturing Plant**

Emission Point	Description
AA-201	Four (4) Submerged Arc Furnaces equipped with individual negative pressure Baghouses (BG1, BG2, BG3, and BG4) for controlling emissions from the maximum production capacity of 2.75 tons/hour per furnace and 11.0 tons/hour utilizing all four furnaces and 21,024 tons/year per furnace and 84,096 tons/year utilizing all four furnaces.
AA-201a	Casting Frames
AA-202	Four (4) 10.0 MMBTU/Hr Natural Gas-Fired Ladle Preheaters (2 ton ladle capacity)
AA-300	**Product Refinement and Handling**
AA-301	Silicon Grinding and Milling Operations equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG6)
AA-400	**Other Plantwide Operations and Activities**
AA-401	One (1) 500 gallon Diesel Storage Tank
AA-402	Plantwide Fugitive Emissions from Roadways
AA-402a	Plantwide Fugitive Emissions from Transport of Raw Materials (Material Storage Piles to SAF Charging Building)
AA-403	Slag Handling and Storage
AA-404	Silica Fume Silos
AA-405	Facility Wide Miscellaneous Operations subject to APC-S-6 *(Insignificant Activities)*
AA-500	**Emergency Support Equipment**
AA-501	One (1) 670 HP Diesel-Fired Emergency Generators

PART III
EMISSION POINT SPECIFIC LIMITATIONS AND STANDARDS

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-000 *(Entire Facility)*	PSD Construction Permit Issued November 27, 2013	III.1	Silicon Production	84,096 tpy
		III.2	Natural Gas Combustion	350,000 MMBtu/yr
		III.3	NOx	1,906.2 tpy
		III.4	CO	1,444.3 tpy
		III.5	SO2	2,170.1 tpy
		III.6	VOC	93.5 tpy
		III.7	PM/PM10	81.8 tpy
		III.8	PM2.5	73.33 tpy
		III.9	HAP	9.90 tpy (Single)
				24.9 tpy (Combined)
AA-101 *(Coal Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier (where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.11	Material Throughput Rate	105,120 tpy
AA-101a (Coal Conveyance)	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-102 *(Wood Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.13	Material Throughput Rate	212,763 tpy

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-102a (Wood Conveyance)	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-102b *(Wood Chipper)*	PSD Construction Permit Issued November 27, 2013	III.14	PM/PM10/ PM2.5	BACT: Operation with an enclosure that will minimize fugitive emissions and limited hours of operation
AA-103 *(Quartz Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.15	Material Throughput Rate	212,763 tpy
AA-103a (Quartz Conveyance)	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-104 *(Limestone Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.16	Material Throughput Rate	183 tpy
AA-105 *(Storage Piles Processing)*	PSD Construction Permit Issued November 27, 2013	III.17	PM/PM10/ PM2.5	BACT: Development of Dust Control Plan including measures to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required
AA-106 *(Storage Pile Wind Erosion)*	PSD Construction Permit Issued November 27, 2013	III.18	PM/PM10/ PM2.5	BACT: Implementation of a Fugitive Dust Control Plan. Visible emissions shall be controlled using water, dust suppressants, or wind screens as needed.

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-200 *(Silicon Processing)*	PSD Construction Permit Issued November 27, 2013	III.28	Opacity	6% exiting roof vents
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued November 27, 2013	III.19	PM/PM10/ PM2.5	BACT: 0.005 gr/dscf and use of fabric filter control (i.e., baghouse)
	40 CFR 60.262(a)(1)	III.20	PM	0.99 lb/MW-hr (compliance with 40 CFR 60, Subpart Z)
	PSD Construction Permit Issued November 27, 2013	III.21	GHG (as CO2e)	BACT: 95,467 tpy of CO2e per furnace and 381,866 tpy of CO2e f for all Furnaces combined; Use of Semi-Enclosed Furnace; and Good Operation and Maintenance
		III.22	NOx	BACT: 45.0 lbs/ton (averaged over a 3-hr period) of Silicon produced
		III.23	CO	BACT: 34.0 lbs/ton (averaged over a 3-hr period) of Silicon produced; Good Combustion and Operating Practices; Use of Semi-Enclosed Furnace
	40 CFR 60.263(a)	III.24		Less than 20 volume percent on a dry basis
	PSD Construction Permit Issued November 27, 2013	III.25	SO2	BACT: 52.0 lbs/ton (averaged over a 3-hr period) of Silicon produced; and Utilization of Low Sulfur Content Material (where technically feasible)
		III.26	VOC	BACT: 2.4 lbs/ton (averaged over a 30-day period) of Silicon produced; and Good Operating Practices
	40 CFR 60.264(a)	III.27	Opacity	Continuous Opacity Monitoring (COM) Installation and Operation
	PSD Construction Permit Issued November 27, 2013	III.28		3% exiting from the control device (i.e., fabric filter) (since this limit is lower than the 15% emission limitation of 40 CFR 60.264(b) the permittee is in compliance with 4 Subpart Z)
	PSD Construction Permit Issued November 27, 2013	III.54	Operating Limit	Only Two out of the Four Furnaces may be operated at any given time.
		III.55		Requirements to Remove Operating Restrictions

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter[1]	Limit/Standard
AA-201a *(Casting Frames)*	PSD Construction Permit Issued November 27, 2013	III.29	PM/PM10/ PM2.5	BACT: Best Management Practices to minimize the generation of fugitive particulate emissions
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued November 27, 2013	III.30	NOx	BACT: 0.08 lbs/MMBTU; low NOx or equivalent burners/technology; combustion of clean fuel; and good combustion practices
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued November 27, 2013	III.31	GHG	BACT: 117 lb/MMBTU of CO2
				BACT: 0.0022lb/MMBtu of Methane;
				BACT: 0.0002 lb/MMBtu of N2O
				BACT: Good Combustion Practices, Combustion of Natural Gas Only, Periodic Maintenance, and energy efficient burner design including Low NOx burners or equivalent
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued November 27, 2013	III.32	PM/PM10/ PM2.5	BACT: 0.0076 lbs/MMBTU; Combustion of Natural Gas; and Good Combustion Practices
		III.33	CO	BACT: 0.0840 lbs/MMBTU; Combustion of Natural Gas; and Good Combustion Practices
		III.34	SO2	BACT: 0.0006 lbs/MMBtu; Combustion of Clean Fuel (i.e., Combustion of Natural Gas Only); and Good Combustion Practices
		III.35	VOC	BACT: 0.0055lb/MMBtu; Combustion of Natural Gas; and Good Operating Practices
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM control
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued November 27, 2013	III.17	PM/PM10/ PM2.5	BACT: Development of Dust Control Plan including measures to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued November 27, 2013	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued November 27, 2013	III.36	PM/PM10/ PM2.5	BACT: 0.01 gr/dscf for PM10/PM2.5 and the use of Bin Vent Filter for PM Control
AA-404 *(Silica Fume Silo)*	40 CFR 60.262(b) and PSD Construction Permit Issued November 27, 2013	III.37	Opacity	Dust Handling Equipment Emissions shall not exceed 10%
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued November 27, 2013	III.38	PM/PM10/ PM2.5	BACT: Good Combustion and Operating Practices and Compliance with NSPS IIII
			CO	
			VOC	
			NOx	BACT: Good Combustion and Operating Practices; Compliance with NSPS IIII; and Use of Ultra Low Sulfur Diesel (ULSD) fuel
			SO2	
	40 CFR 60.4200(a)(2)(i)	III39	NSPS Subpart IIII	Applicability
	40 CFR 60.4206	III.40		Lifetime Requirements
	40 CFR 60.4205(b)	III.41		Emission Standards
	40 CFR 60.4207(b)	III.42		Diesel Fuel Requirements
AA-000 *(Entire Facility) *where applicable*	40 CFR 64.2(a)	III.43	CAM	Applicability
	40 CFR 60.260	III.44	NSPS Subpart Z	Applicability
	40 CFR 63.11524(a) and (b)(2)	III.45	MACT Subpart YYYYYY	Applicability

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-000 *(Entire Facility)* **where applicable*	40 CFR 63.11525(c)	III.46	MACT Subpart YYYYYY	Compliance Date (Upon Startup)
	40 CFR 63.11526	III.47		Emission Standards
	40 CFR 63.6585(a) and (c) via 63.6590(c)	III.48	MACT Subpart ZZZZ	Compliance via NSPS Subpart IIII
	PSD Construction Permit Issued November 27, 2013	III.49	Opacity	No more than 10%
AA-405 *(Insignificant Activities)* **where applicable*	APC-S-1, Section 3.4(a)(1)	III.50	PM/PM10	0.6 lbs/MMBTU or as otherwise limited by facility modification restrictions
	APC-S-1, Section 3.4(a)(2)	III.51		$E = 0.8808*I^{-0.1667}$ or as otherwise limited by facility modification restrictions.
	APC-S-1, Section 3.8(a)	III.52		0.2 grains/dscf of flue gas calculated to 12% CO_2 by volume
	APC-S-1, Section 4.1(a)	III.53	SO2	4.8 lbs/MMBTU per hour or as otherwise limited by facility modification restrictions
AA-000 (Entire Facility)	PSD Construction Permit Issued November 27, 2013	III.56	SSM	Provisions for Startup, Shutdown, and Malfunction Emissions

III.1 For Emission Point AA-000 (Entire Facility), the permittee shall limit the annual Silicon Production to no more than 84,096 tons per year (tpy) as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.2 For Emission Point AA-000 (Entire Facility), the permittee shall limit Natural Gas Combustion to no more than 350,000 MMBtu per year (MMBTU/yr) as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.3 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Nitrogen Oxides (NOx) to no more than 1,906.2 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.4 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Carbon Monoxide (CO) to no more than 1,444.3 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.5 For Emission Point AA-000 (Entire Faciltiy), the permittee shall limit emissions of Sulfur Dioxide (SO2) to no more than 2,170.1 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.6 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Volatile Organic Compounds (VOCs) to no more than 93.5 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.7 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Particulate Matter/Particulate-10 (PM/PM-10) to no more than 81.8 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.8 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Particulate Matter-2.5 to no more than 73.33 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.9 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Hazardous Air Pollutants (HAPs) to no more than 9.90 tpy for any single HAP and 24.9 tpy for combined HAPs, as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.10 For Emission Points AA-101, AA-102, AA-103, and AA-104 (Coal, Wood, Quartz, and Limestone Storage Pile Material Handling Areas), the permittee shall implement as appropriate the following Best Management Practices for minimizes PM emissions (BACT for PM/PM10/PM2.5);

(a) Install a 3-sided windscreen barrier (where technically feasible);
(b) Reduce drop heights;
(c) Use chemical stabilizers;

(d) Use watering Techniques; and
(e) Develop and Implement a Fugitive Dust Control Plan

(Ref.: PSD Construction Plan Issued Issuance Date)

III.11 For Emission Point AA-101 (Coal Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 105,120 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.12 For Emission Point AA-101a, AA-102a, AA-103a, AA-301, and AA-403 (Coal, Wood, and Quartz Conveyance, Silicon Grinding and Milling, and Slag Handling and Storage) the permittee shall limit PM/PM10/PM2.5 emissions to no more than 0.003 grains per dry standard cubic foot (gr/dscf) and use a baghouse for PM/PM10/PM2.5 control (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.13 For Emission Point AA-102 (Wood Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 212,763 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.14 For Emission Point AA-102b (Wood Chipper), the permittee shall operate with an enclosure that will minimize fugitive emissions and limit the hours of operations to minimize PM/PM10/PM2.5 emissions (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.15 For Emission Point AA-103 (Quartz Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 212,763 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.16 For Emission Point AA-104 (Limestone Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 183 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.17 For Emission Point AA-105 (Storage Piles Processing), the permittee shall implement a Dust Control Plan for minimizing PM/PM10/PM2.5 emissions (BACT for PM/PM10/PM2.5) which shall include as appropriate the following;

(a) Application of a wet suppressants;
(b) Watering Application;
(c) Spreed Reduction Implementation and Postings; and
(d) Vacuuming or Sweeping Methodologies

(Ref.: PSD Construction Plan Issued Issuance Date)

III.18 For Emission Point AA-106 (Storage Pile Wind Erosion), the permittee shall implement a Fugitive Dust Control Plan for minimizing PM/PM10/PM2.5 emissions (BACT for

PM/PM10/PM2.5) which shall include as appropriate the following for controlling Visible Emissions:

(a) Water Application;
(b) Dust Suppressants; and
(c) Wind Screens

(Ref.: PSD Construction Plan Issued Issuance Date)

III.19 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit PM/PM10/PM2.5 emissions to no more than 0.005 gr/dscf and use a baghouse for PM control (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.20 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall limit PM emissions to no more than 0.99 lb/MW-hr for determining compliance with 40 CFR 60, Subpart Z. (Ref.: 40 CFR 60.262(a)(1))

III.21 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit emissions of Greenhouse Gases, expressed as Carbon Dioxide equivalent, to no more than 95,467 tpy per furnace and 381,866 tpy for all four furnaces combined, as determined for each consecutive 12-month period, and shall also use semi-enclosed furnaces and employ good operating and maintenance techniques (BACT for GHG (as CO2e)). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.22 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit NOx emissions to no more than 45.0 lbs/ton as determined by a 3-hr rolling average period of Silicon produced (BACT for NOx). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.23 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit CO emissions to no more than 34.0 lbs/ton, as determined by a 3-hr rolling average period of Silicon produced, and Utilize Good Combustion and Operation Practices and Semi-Enclosed Furnaces (BACT for CO). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.24 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall limit CO emissions to no more than 20 volume percent on a dry basis for determining compliance with 40 CFR 60, Subpart Z. (Ref.: 40 CFR 60.263(a)). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.25 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit SO2 emissions to no more than 52.0 lbs/ton, as determined by a 3-hr rolling average period of Silicon produced, and Utilize Low Sulfur Content Material where technically feasible (BACT for SO2). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.26 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit VOC emissions to no more than 2.4 lbs/ton, as determined by a 30-day rolling average period of Silicon produced, and Utilize Good Operating Practices (BACT for VOC). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.27 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall install, calibrate, maintain, and operate a Continuous Opacity Monitoring (COM) Device as specified in 40 CFR 60.264(a). (Ref.: 40 CFR 60.264(a)).

III.28 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 – Subpart Z. and report as excess emissions all six-minute periods in which the average opacity is 3 perrcent or greater leaving the control device (i.e., fabric filter) as required by the federally enforceable PSD Construction herein. For Emission Point AA-200 (Silicon Processing), the permittee shall have emissions of Opacity equal to or less than 6% exiting the roof vents or areas where the Silicon is melted and refined. (Ref.: 40 CFR 264(b) for AA-201 and PSD Construction Perrmit issued Issuance Date for AA-200 and AA-201)

III.29 For Emission Point AA-201a (Casting Frames), the permittee shall implement a system for ensuring that a system of Best Management Practices is implemented to minimize the generation of fugitive particulate emissions (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.30 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of NOx to no more than 0.08 lbs/MMBtu and utilize low NOx or equivalent burners/technology, combust clean fuel only and implement good combustion practices (BACT for NOx). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.31 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of Greenhouse Gases (GHG) to the following BACT emissions limitations (BACT for GHG):

(a) Carbon Dioxide (CO2) emissions to no more than 117 lb/MMBtu
(b) Methane emissions to no more than 0.0022 lb/MMBtu
(c) Nitrous Oxide emissions to no more than 0.0002 lb/MMBtu
(d) Good Combustion Practices, Combustion of Natural Gas Only, Periodic Maintenance, and energy efficient burner design including Low NOx burners or equivalent.

(Ref.: PSD Construction Permit Issued November 27, 2013)

III.32 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of PM/PM10/PM2.5 to no more than 0.0076 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.33 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of CO to no more than 0.0840 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for CO). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.34 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of SO2 to no more than 0.0006 lbs/MMBtu, combust clean fuels only (i.e., natural gas only), and utilize good combustion practices (BACT for SO2). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.35 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of VOC to no more than 0.0055 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for VOC). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.36 For Emission Point AA-404 (Silica Fume Silo), the permittee shall limit emissions of PM/PM10/PM2.5 to no more than 0.01 gr/dscf for PM/PM10/PM2.5 and the use of Bin Vent Filter (BACT for PM/PM10/PM2/5). (PSD Construction Permit Issued November 27, 2013)

III.37 For Emission Point AA-404 (Silica Fume Silo), the permittee is subject to 40 CFR 60.262(b) and shall limit emissions of Opacity from the Dust Handling Equipment to no more than 10% at any time. (Ref.: 40 CFR 60.262(b))

III.38 For Emission Point AA-501 (Emergency Generators), the permittee shall utilize Good Combustion and Operating Practices, utilize Ultra Low Sulfur Diesel (ULSD) Fuel, and comply with 40 CFR 60 – Subpart IIII for demonstrating compliance with PM/PM10/PM2.5, CO, VOC, NOx, and SO2. (BACT for PM/PM10/PM2.5, CO, and VOC is the Good Combustion and Operating Practices as well as complying with Subpart IIII and BACT for NOx and SO2 is Good Combustion and Operating Practices, compliance with Subpart IIII, and use of ULSD Fuel). (Ref.: PSD Construction Permit Issued November 27, 2013)

III.39 For Emission Point AA-501, the permittee is subject to 40 CFR 60 – New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines (Subpart IIII), specifically 40 CFR 60.4200(a)(2)(i), and shall comply with the applicable provisions. (Ref.: 40 CFR 60.4200(a)(2)(i))

III.40 For Emission Point AA-501, the permittee is subject to 40 CFR 60.4206 and shall comply with the applicable provisions and achieve the emission standards over the life of the engine. (Ref.: 40 CFR 60.4206)

III.41 For Emission Point AA-501, the permittee is subject to 40 CFR 4205(b) and shall comply with the applicable provision and shall achieve compliance with the emission standards. (Ref.: 40 CFR 4205(b))

III.42 For Emission Point AA-501, the permittee is subject to 40 CFR 4207(b) and shall comply with the Diesel Fuel Requirements of 40 CFR 50.510(b). (Ref.: 40 CFR 40.4207(b))

III.43 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 64.2(a) – Compliance Assurance Monitoring (CAM) Provisions where applicable and the applicable CAM Plan is not due until the Title V Permit to Operate is due, which is specified herein, as a requirement upon certification of construction (i.e., Condition I.16). (Ref.: 40 CFR 64.2(a))

III.44 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 60.260 – Subpart Z, Standards of Performance for Ferroalloy Production Facilities and shall comply with the applicable provisions. (Ref.: 40 CFR 60.260)

III.45 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11524(a) and (b)(2) – Subpart YYYYYY, National Emission Standards for Hazardous Air Pollutants for Area Sources: Ferroalloy Production Facilities and shall comply with the applicable provisions. (Ref.: 40 CFR 63.11524(a) and (b)(2))

III.46 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11525(c) and shall comply upon startup of the Ferroalloy Production Facility. (Ref.: 40 CFR 63.11525(c))

III.47 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11526 and shall comply with the following for demonstrating compliance with MACT YYYYYY:

(a) You shall not discharge to the atmosphere visible emissions (VE) from the control device that exceed 5 percent of accumulate occurrences in a 60-minute observation period.

(b) You shall not discharge to the atmosphere fugitive PM emissions from the furnace building containing the electrometallurgical operations that exhibit opacity greater than 20 percent (6-minute average), except for one 6-minute average per hour that does not exceed 60 percent.

(Ref.: 40 CFR 63.11526)

III.48 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63 – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines and shall comply with this subpart by demonstrating compliance with the applicable provisions of 40 CFR 60 – Subpart IIII, as specified in 40 CFR 63.6585(a) and (c) via 63.6590(c). (Ref.: 40 CFR 63.6585(a) and (c) via 63.6590(c))

III.49 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Opacity to no more than 10% at any time. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.50 For Emission Point AA-405 (Insignificant Activities), the maximum permissible emission of ash and/or particulate matter from each fossil fuel burning installations of less than 10 million BTU per hour heat input shall not exceed 0.6 pounds per million BTU per hour heat input. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.D(1)(a).)

III.51 For Emission Point AA-405 (Insignificant Activities), the maximum permissible emission of ash and/or particulate matter from fossil fuel burning installations equal to or greater than 10 million BTU per hour heat input but less than 10,000 million BTU per hour heat input shall not exceed an emission rate as determined by the relationship

$$E = 0.8808*I^{-0.1667}$$

where E is the emission rate in pounds per million BTU per hour heat input and I is the heat input in millions of BTU per hour. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.D(1)(b).)

III.52 For Emission Point AA-405 (Insignificant Activities), the permittee shall not cause the maximum discharge of particulate matter to exceed 0.2 grains per standard dry cubic foot of flue gas calculated to twelve percent (12%) carbon dioxide by volume for products of combustion. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.H(1).)

III.53 For Emission Point AA-405 (Insignificant Activities), the permittee shall not cause the maximum discharge of sulfur oxides from any fuel burning installations in which the fuel is burned primarily to produce heat or power by indirect heat transfer to exceed 4.8 pounds(measured as sulfur dioxide) per million BTU heat input. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.4.A(1).)

III.54 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is only authorized to operate two (2) out of the four (4) Submerged Arc Furnaces at any given time and shall never operate all four combined Submerged Arc Furnaces at one time. (Ref.: PSD Construction issued Issuance Date)

III.55 For Emission Pint AA-201 (Submerged Arc Furnaces), the permittee can formally request a modification to this permit to remove the restriction on the number of Submerged Arc Furnaces that can operate at any given time. To request elimination of this restriction via permit modication, the permittee must submit a demonstration to the MDEQ, EPA, and the FLM that operation of 3 or 4 Submerged Arc Furnaces simultaneously would not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS), or exceed the visibility thresholds or deposition analysis thresholds (DAT) for Sipsey Wilderness or Mingo National Wildlife Refuge (both are federally mandated Class I areas). The applicant will follow EPA's Appendix W requirements and the 2010 Federal Land Managers' Air Quality Related Values Workgroup (FLAG) document for conducting an air quality impact evaluation to Class II and Class I areas, respectively. Operation of 3 or 4 Submerged Arc Furnaces at any given time can only occur after a PSD permit modification is issued by MDEQ. (Ref.: PSD Construction Permit Issued November 27, 2013)

III.56 For Emission Point AA-000 (Entire Facility), Startup and Shutdown emissions have been accounted for in the individual emission limitations for the facility including the BACT emission limitations, and therefore all emission point specific limits of the federally enforceable permit herein apply at all times including startup and shutdown. The necessary monitoring (i.e., Continuous Emissions Monitoring Systems, Performance Testing) should validate the potential emissions when these events occur. Malfunction emissions are those emissions that would normally not occur because of unforeseen instances and not part of any routine or normal method of operation as defined by 11 Miss. Admin. Code Pt. 2, Ch. 1. (Ref.: PSD Construction Permit Issued November 27, 2013)

PART IV
EMISSION POINT SPECIFIC MONITORING REQUIREMENTS

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-000 *(Entire Facility)*	PSD Construction Permit Issued November 27, 2013	IV.1	Silicon Production	Determine the Production for each consecutive 12-month period
		IV.2	Natural Gas Combustion	Determine the total Combustion Rate
		IV.3	Opacity	Determine using Method 22 and then Method 9 if emissions are present
		IV.4	Pretest Conference/ Protocol	30-days prior to performance testing if requested by MDEQ upon 60 day advanced of Stack Test Protocol
		IV.5	Control Equipment	Regular Maintenance shall be performed and kept in log form
		IV.6	NOx	Determine the Emission Rate for each consecutive 12 month period
		IV.7	CO	
		IV.8	SO2	
		IV.9	VOC	
		IV.10	PM/PM10	
		IV.11	PM2.5	
		IV.12	HAP	
AA-101 *(Coal Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period
AA-101a (Coal Conveyance)	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-102 *(Wood Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period
AA-102a (Wood Conveyance)	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-102b *(Wood Chipper)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-103 *(Quartz Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period
AA-103a (Quartz Conveyance)	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Fugitive Dust Control Plan for demonstrating compliance with BACT
AA-104 *(Limestone Storage Pile Material Handling)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period
AA-105 *(Storage Piles Processing)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Fugitive Dust Control Plan for demonstrating compliance with BACT

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-106 *(Storage Pile Wind Erosion)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.15	GHG (as CO2e)	Determine the CO2e Emission Rate for each consecutive 12 month period
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued November 27, 2013	IV.16	NOx	Installation and Operation of CEMS
			CO	
			SO2	
			VOC	Initial Performance Test for Demonstrating Operational Ranges
			PM/PM10	
			PM2.5	
AA-201 *(Submerged Arc Furnaces)*	40 CFR 60.264	IV.17	NSPS Subpart Z	COMs Requirements
	40 CFR 60.265	IV.18		Monitoring of Operations
	40 CFR 60.266	IV.19		Compliance with Test Methods and Procedures
	40 CFR 63.11527(a)	IV.25	MACT Subpart YYYYYY	Monitoring
	40 CFR 63.11528	IV.26		Performance Testing and Compliance Requirements
AA-201a *(Casting Frames)*	PSD Construction Permit Issued November 27, 2013	IV.20	PM/PM10/ PM2.5	Utilize Best Management Practices for demonstrating compliance with BACT

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued November 27, 2013	IV.21	NOx	Utilize Good Combustion Practices and Implement Maintenance Guidelines for demonstrating compliance with BACT
			GHG	
			PM/PM10/ PM2.5	
			CO	
			SO2	
			VOC	
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued November 27, 2013	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued November 27, 2013	IV.22	PM/PM10/ PM2.5	Implement Maintenance Guidelines for demonstrating compliance with BACT
			CO	
			VOC	
			NOx	
			SO2	

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-501 *(Emergency Generators)*	40 CFR 60.4209	IV.23	NSPS Subpart IIII	Monitoring and Compliance Requirements
	40 CFR 60.4211(a), (c), (f), and (g)	IV.24		

IV.1 For Emission Point AA-000 (Entire Facility), the permittee shall determine the Silicon Produced for each consecutive 12-month period by obtaining data from purchasing, processing, and production, and any other data necessary to determine the facility wide production rate as determined for each consecutive 12-month period, for demonstrating compliance with Condition III.1 of the permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.2 For Emission Point AA-000 (Entire Facility), the permittee shall determine the Natural Gas Combustion Rate total for each consecutive 12-month period by utilizing energy records, reports, and any other data necessary to determine the facility wide Natural Gas Combustion Rate for determining compliance with Condition III.2 of the permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.3 For Emission Point AA-000 (Entire Facility), the permittee shall perform weekly Visual Emission Evaluations (VEEs/Observations) by Method 22, 40 CFR 60, Appendix A. Observations shall be conducted during daylight hours and while the equipment is in operation. If visible emissions are observed, excluding condensed water water vapor, the permittee shall:

(a) Within 24 hours, take corrective action that eliminates the visible emissions or verify that the unit causing the emission and any associated air pollution control equipment are operating normally in accordance with desiggn and standards procedures, and under the same conditions in which compliance was achieved in the past, and

(b) If visible emissions are not eliminated, have a certified visual emissions observer determine compliance with the opacity standard using EPA Reference Method 9 within three business days, and

(c) Report the visible emissions as a potential deviation (or as a violation if demonstrated by EPA Reference Method 9) according to the reporting requirements of this permit.

(Ref.: PSD Construction Permit Issued November 27, 2013)

IV.4 For Emission Point AA-000 (Entire Facility), the permittee shall submit a Performance Test Protocol 60 days prior to any Performance Test. Upon receipt of the Performance Test Protocol, the MDEQ may request a Pretest Conference to discuss the Performance Testing at least 30 days in advance of the Performance Test to discuss the Peformance Test or Performance Test Protocol. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.5 For Emission Point AA-000 (Entire Facility), the permittee shall perform regular maintenance on the control equipment according to the manufacturer design and recommendations. This maintenance shall be kept in log form and made available to MDEQ during inspections. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.6 For Emission Point AA-000 (Entire Facility), the permittee shall determine the NOx emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.3 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.7 For Emission Point AA-000 (Entire Facility), the permittee shall determine the CO emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.4 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.8 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the SO2 emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.5 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.9 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the VOC emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.6 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.10 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the PM/PM10 emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.7 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.11 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the PM2.5 emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.8 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.12 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the HAP (Individual and Combined) emission rates as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.9 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.13 For Emission Points AA-101 (Coal Storage Pile Material Handling), AA-101a (Coal Conveyance), AA-102 (Wood Storage Pile Material Handling), AA-102a (Wood

Conveyance), AA-102b (Wood Chipper), AA-103 (Quartz Storage Pile Material Handling), AA-103a (Quartz Conveyance), AA-104 (Limestone Storage Pile Material Handling), AA-105 (Storage Piles Processing), AA-106 (Storage Pile Wind Erosion), AA-301 (Silicon Grinding and Milling), AA-402 and AA-402a (Unpaved and Paved Roads and Plantwide Transport Fugitive Emissions), the permittee shall develop and implement a Dust Control Plan for demonstrating compliance with the individual BACT Limits for PM/PM10/PM2.5, specifically Conditions III. III.10, III.12, III.14, III.17, and III.18, of the federally enforceable permit herein. For each emission point that operates a baghouse, the permittee shall install, maintain, and operate a continuous pressure drop monitor to monitor and record the differential pressure at least every 15 minutes. For each baghouse, the permittee shall establish a pressure drop range based on stack test data, vendor information, operational history, and/or visual inspections that indicates proper operation of the baghouse. These pressure drop ranges shall be maintained at the facility and be made available upon request from MDEQ personnel. Should a pressure drop reading fall outside the established range, the permittee shall immediately inspect the baghouse to determine the cause of the excursion and return the baghouse to normal operating conditions. The emission point ID, date, time, length of the excursion, and reason for an excursion from an established pressure drop range shall be recorded and any corrective measures taken to restore the baghouse to normal operating conditions shall be noted. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.14 For Emission Points AA-101 (Coal Storage Pile Material Handling), AA-102 (Wood Storage Pile Material Handling), AA-103 (Quartz Storage Pile Material Handling), and AA-104 (Limestone Storage Pile Material Handling), the permittee shall determine the Material Throughput Rate as determined for each consecutive 12-month period by utilizing data obtained from Purchasing Records, Production Records, and any other data necessary to demonstrate compliance with Condition III.11, III.13, III.15, and III.16, of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.15 For Emission Point AA-201 (Submerged Arc Furnaces), the permitee shall determine the CO2e emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III. 21 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.16 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee shall install and operate a Continuous Emission Monitoring (CEM) System on the furnace baghouses for monitoring NOx, CO, and SO2 immediately upon operation of the furnaces and not beginning operation as defined by Condition I.15 of the federally enforceable permit herein (i.e, for the purpose of this permit and this condition specifically, the furnace baghouses will be treated as stand-alone units so that the CEMS will be installed sooner rather than later with regard to monitoring and compliance). The CEMS shall meet the applicable performance specification required by 40 PART 60, Appendix B, the applicable quality assurance procedures required by 40 CFR Part 60, Appendix F, and the requirements of 40 CFR 60.13. In lieu of the requirements of 40 CFR Part 60, Appendix F, 5.1.1, 5.1.3, and 5.1.4, the permittee may conduct either a Relative Accuracy Audit (RAA) or a Relative

Accuracy Test Audit (RATA) on each CEMs at least once every three (3) years. The permittee shall conduct Cylinder Gas Audits (CGA) each calendar quarter during which a RAA or a RATA is not performed. A CEMS is not required for PM, PM10, PM2.5 and VOC, but rather the permittee is required to perform an initial stack test within 180 days of reaching maximum production (not to exceed three years from start-up of Phase 1 of the facility) and develop operational ranges for demonstrating compliance with the PM, PM10, PM2.5 and VOC BACT limits. The permittee shall utilize Method 5 for PM/PM10, Method 201A for PM2.5, and Method 25A for VOC. The permittee shall repeat the performance if the facility's operations change such that the operational ranges would no longer be valid for determining compliance with the PM, PM10, PM2.5 or VOC BACT limits. The permittee may be required to repeat the Operation Range Performance Test at the MDEQ's discretion and request at any time during the Operating Permit (Title V) Term if the MDEQ determines necessary. During the performance test, the permittee shall monitor the following:

(a) Charge Weights and Materials, Tap Weights, and Materials;
(b) Heat Times, including Start and Stop Times, and a log of Process Operations, Including periods of no Operations during testing;
(c) Control Device Operation Log; and
(d) Continuous Monitor or Reference Method 9 data which is required to be performed and documented during said Performance Test.

In the event that the CEMS fails* so that the permittee cannot collect emissions data for NOx, CO, and SO2, the permittee will performance test for NOx, CO, and SO2 at a frequency of no less than monthly until such time that the CEMS system is performing to the manufacturer design and specification as required and specified in the above condition. *Failure of the CEMS is to be determined by the staff of the MDEQ so that the permittee must expediently and readily develop a means of correcting the systems for collecting and measuring emissions in a timely manner.

(Ref.: PSD Construction Permit Issued November 27, 2013)

IV.17 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.264 and shall comply with the following emissions monitoring requirements for demonstrating compliance:

(a) The permittee is subject to the provisions of this subpart shall install, calibrate, maintain and operate a continuous monitoring system for measurement of the opacity of emissions discharged into the atmosphere from the control device(s).

(b) For the purpose of reports required under 40 CFR 60.7(c), the permittee shall report as excess emissions all six-minute periods in which the average opacity is 15 percent or greater.

(c) The permittee subject to the provisions of this subpart shall submit a written

report of any product change to the DEQ. Reports of product changes must be postmarked not later than 30 days after implementation of the product change.

(Ref.: 40 CFR 60.264)

IV.18 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.265 and shall monitor the following operations for demonstrating compliance:

(a) The permittee of any electric submerged arc furnace subject to the provisions of this subpart shall maintain daily records of the following information:

(1) Product being produced.
(2) Description of constituents of furnace charge, including the quantity, by weight.
(3) Time and duration of each tapping period and the identification of material tapped (slag or product.)
(4) All furnace power input data obtained under paragraph (b) of this section.
(5) All flow rate data obtained under paragraph (c) of this section or all fan motor power consumption and pressure drop data obtained under paragraph (e) of this section.

(b) The permittee subject to the provisions of this subpart shall install, calibrate, maintain, and operate a device to measure and continuously record the furnace power input. The furnace power input may be measured at the output or input side of the transformer. The device must have an accuracy of ±5 percent over its operating range.

(c) The permittee subject to the provisions of this subpart shall install, calibrate, and maintain a monitoring device that continuously measures and records the volumetric flow rate through each separately ducted hood of the capture system, except as provided under paragraph (e) of this section. The permittee of an electric submerged arc furnace that is equipped with a water cooled cover which is designed to contain and prevent escape of the generated gas and particulate matter shall monitor only the volumetric flow rate through the capture system for control of emissions from the tapping station. The permittee may install the monitoring device(s) in any appropriate location in the exhaust duct such that reproducible flow rate monitoring will result. The flow rate monitoring device must have an accuracy of ±10 percent over its normal operating range and must be calibrated according to the manufacturer's instructions. The DEQ may require the permittee to demonstrate the accuracy of the monitoring device relative to Methods 1 and 2 of appendix A to this part.

(d) When performance tests are conducted under the provisions of 40 CFR 60.8 of this part to demonstrate compliance with the standards under 40 CFR 60.262(a) (4) and (5), the volumetric flow rate through each separately ducted hood of the capture system must be determined using the monitoring device required under paragraph (c) of this section. The volumetric flow rates must be determined for furnace power input levels at 50 and 100 percent of the nominal rated capacity of the electric submerged arc furnace. At all times the electric submerged arc furnace is operated, the permittee shall maintain the volumetric flow rate at or above the appropriate levels for that furnace power input level determined during the most recent performance test. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator shall maintain the exhaust flow rates through the capture system over the tapping station at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the DEQ to be unacceptable operation and maintenance of the affected facility. The owner or operator may request that these flow rates be reestablished by conducting new performance tests under 40 CFR 60.8 of this part.

(e) The permittee may as an alternative to paragraph (c) of this section determine the volumetric flow rate through each fan of the capture system from the fan power consumption, pressure drop across the fan and the fan performance curve. Only data specific to the operation of the affected electric submerged arc furnace are acceptable for demonstration of compliance with the requirements of this paragraph. The permittee shall maintain on file a permanent record of the fan performance curve (prepared for a specific temperature) and shall:

(1) Install, calibrate, maintain, and operate a device to continuously measure and record the power consumption of the fan motor (measured in kilowatts), and

(2) Install, calibrate, maintain, and operate a device to continuously measure and record the pressure drop across the fan. The fan power consumption and pressure drop measurements must be synchronized to allow real time comparisions of the data. The monitoring devices must have an accuracy of ±5 percent over their normal operating ranges.

(f) The volumetric flow rate through each fan of the capture system must be determined from the fan power consumption, fan pressure drop, and fan performance curve specified under paragraph (e) of this section, during any performance test required under 40 CFR 60.8 to demonstrate compliance with the standards under 40 CFR 60.262(a)(4) and (5). The permittee shall determine the volumetric flow rate at a representative temperature for furnace power input levels of 50 and 100 percent of the nominal rated capacity of the

electric submerged arc furnace. At all times the electric submerged arc furnace is operated, the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow rate is at or above the levels established during the most recent performance test for that furnace power input level. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow rate is at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the DEQ to be unacceptable operation and maintenance of the affected facility. The permittee may request that these flow rates be reestablished by conducting new performance tests under 40 CFR 60.8. The DEQ may require the owner or operator to verify the fan performance curve by monitoring necessary fan operating parameters and determining the gas volume moved relative to Methods 1 and 2 of appendix A to this part.

(g) All monitoring devices required under paragraphs (c) and (e) of this section are to be checked for calibration annually in accordance with the procedures under 40 CFR 60.13(b).

(Ref.: 40 CFR 60.265)

IV.19 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.266 and shall comply with the following Test Methods and Procedures:

(a) During any performance test required in 40 CFR 60.8, the permittee shall not allow gaseous diluents to be added to the effluent gas stream after the fabric in an open pressurized fabric filter collector unless the total gas volume flow from the collector is accurately determined and considered in the determination of emissions.

(b) In conducting the performance tests required in 40 CFR 60.8, the permittee shall use as reference methods and procedures the test methods in appendix A of this part or other methods and procedures as specified in this section, except as provided in 40 CFR 60.8(b).

(c) The permittee shall determine compliance with the particulate matter standards in 40 CFR 60.262 as follows:

(1) The emission rate (E) of particulate matter shall be computed for each run using the following equation:

$$E = \left[\left(\sum_{i=1}^{N} C_{si} Q_{sdi}\right)\right] / (PK)$$

where:

E=emission rate of particulate matter, kg/MW-hr (1b/MW-hr).
n=total number of exhaust streams at which emissions are quantified.
c_{si} =concentration of particulate matter from exhaust stream "i", g/dscm (gr/dscf).
Q_{sdi} =volumetric flow rate of effluent gas from exhaust stream "i", dscm/hr (dscf/hr).
P=average furnace power input, MW.
K=conversion factor, 1000 g/kg (7000 gr/lb).

(2) Method 5 shall be used to determine the particulate matter concentration (c_{si}) and volumetric flow rate (Q_{sdi}) of the effluent gas, except that the heating systems specified in sections 2.1.2 and 2.1.6 are not to be used when the carbon monoxide content of the gas stream exceeds 10 percent by volume, dry basis. If a flare is used to comply with 40 CFR 60.263, the sampling site shall be upstream of the flare. The sampling time shall include an integral number of furnace cycles.

(i) When sampling emissions from open electric submerged arc furnaces with wet scrubber control devices, sealed electric submerged arc furnaces, or semienclosed electric arc furnaces, the sampling time and sample volume for each run shall be at least 60 minutes and 1.80 dscm (63.6 dscf).

(ii) When sampling emissions from other types of installations, the sampling time and sample volume for each run shall be at least 200 minutes and 5.66 dscm (200 dscf).

(3) The measurement device of 40 CFR 60.265(b) shall be used to determine the average furnace power input (P) during each run.

(4) Method 9 and the procedures in 40 CFR 60.11 shall be used to determine opacity.

(5) The emission rate correction factor, integrated sampling procedure of Method 3B shall be used to determine the CO concentration. The sample shall be taken simultaneously with each particulate matter sample.

(d) During the particulate matter run, the maximum open hood area (in hoods with segmented or otherwise moveable sides) under which the process is expected to be operated and remain in compliance with all standards shall be recorded. Any future operation of the hooding system with open areas in excess of the maximum is not permitted.

(e) To comply with 40 CFR 60.265 (d) or (f), the permittee shall use the monitoring devices in 40 CFR 60.265 (c) or (e) to make the required measurements as determined during the performance test.

(Ref.: 40 CFR 60.266)

IV.20 For Emission Point AA-201a (Casting Frames), the permittee shall utilize Best Management Practices for demonstrating compliance with the minimization of fugitive particulate emissions as required by Condition III.29 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.21 For Emission Point AA-202 (Ladle Preheaters), the permittee shall utilize Good Combustion Practices and Implement Maintenance Guidelines for demonstrating compliance with the NOx, GHG, PM/PM10/PM2.5, CO, SO2, and VOC BACT Limits as described in Conditions III.29, III.30, III.31, III.32, III.33, and III.34 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.22 For Emission Point AA-501 (Emergency Generators), the permittee shall implement Maintenance Guidelines for demonstrating compliance with PM/PM10/PM2.5, CO, VOC, NOx, and SO2 BACT limits as described in Condition III.37 of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

IV.23 For Emission Point AA-501 (Emergency Generators), if the permittee is subject to the monitoring provisions then the permittee shall also comply with the Monitoring and Compliance Requirements of 40 CFR 60.4209 and either comply by installing a non-resettable hour meter or a diesel particulate filter with a backpressure monitor. (Ref.: 40 CFR 60.4209)

IV.24 For Emission Point AA-501 (Emergency Generators), if the permittee is subject to the emissions standards of 40 CFR 60 – Subpart IIII, the permittee shall comply with the requirements of 40 CFR 60.4211(a), (c), (f), and (g)). (Ref.: 40 CFR 60.4211(a), (c), (f), and (g))

IV.25 For Emission Point AA-201 (Submerged Arc Furnacec), the permittee is subject to the monitoring provision of 40 CFR 63, Subpart YYYYYY and shall comply with the following:

(a) Each *EAF equipped with fabric filters* —

(1) *Visual monitoring.* The permittee shall perform visual monitoring of the monovent or fabric filter outlet stack(s) for any VE according to the schedule specified in paragraphs (a)(1)(i) and (a)(1)(ii) of this section.

(i) *Daily visual monitoring.* Perform visual determination of fugitive emissions once per day, on each day the process is in operation, during operation of the process.

(ii) *Weekly visual monitoring.* If no visible fugitive emissions are detected in consecutive daily visual monitoring performed in accordance with paragraph (a)(1)(i) of this section for 90 days of operation of the process, the permittee may decrease the frequency of visual monitoring to once per calendar week of time the process is in operation, during operation of the process. If visible fugitive emissions are detected during these inspections, the permittee shall resume daily visual monitoring of that operation during each day that the process is in operation, in accordance with paragraph (a)(1)(i) of this section until the permittee satisfies the criteria of this section to resume conducting weekly visual monitoring.

(2) If the visual monitoring reveals the presence of any VE, the permittee shall conduct a Method 22 (appendix A-7 of 40 CFR part 60) test following the requirements of 40 CFR 63.11528(b)(1) within 24 hours of determining the presence of any VE.

(3) If you own or operate an existing affected source, the permittee shall install, operate, and maintain a bag leak detection system for each fabric filter as an alternative to the monitoring requirements in paragraph (a)(1) of this section. If the permittee owns or operates a new affected source, the permittee shall install, operate, and maintain a bag leak detection system for each fabric filter according to the requirements in paragraphs (a)(3)(i) through (a)(3)(vii) of this section. Such source is not subject to the requirements in paragraphs (a)(1) and (a)(2) of this section.

(i) The system must be certified by the manufacturer to be capable of detecting emissions of PM at concentrations of 10 milligrams per actual cubic meter (0.00044 grains per actual cubic foot) or less.

(ii) The bag leak detection system sensor shall provide output of relative PM loadings and the owner or operator shall continuously record the output from the bag leak detection system using a strip chart recorder, data logger, or other means.

(iii) The system must be equipped with an alarm that will sound when an increase in relative PM loadings is detected over the alarm set point established in the operation and maintenance plan, and the alarm must be located such that it can be heard, seen, or otherwise detected by the appropriate plant personnel.

(iv) The initial adjustment of the system must, at minimum, consist of establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device, and establishing the alarm set points. If the system is equipped with an alarm delay time feature, the permittee shall also must establish a maximum reasonable alarm delay time.

(v) Following the initial adjustment, do not adjust the sensitivity or range, averaging period, alarm set point, or alarm delay time, except that, once per quarter, the permittee may adjust the sensitivity of the bag leak detection system to account for seasonal effects including temperature and humidity.

(v) For fabric filters that are discharged to the atmosphere through a stack, the bag leak detector sensor shall be installed downstream of the fabric filter and upstream of any wet scrubber.

(vi) Where multiple detectors are required, the system's instrumentation and alarm may be shared among detectors.

(4) When operating a bag leak detection system, if an alarm sounds, conduct visual monitoring of the monovent or fabric filter outlet stack(s) as required in paragraph (a)(1) of this section within 1 hour. If the visual monitoring reveals the presence of any VE, the permittee shall conduct a Method 22 test following the requirements of 40 CFR 63.11528(b)(1) within 24 hours of determining the presence of any VE.

(5) The permittee shall prepare a site-specific monitoring plan for each bag leak detection system. The permittee shall operate and maintain each bag leak detection system according to the plan at all times. Each plan must address all of the items identified in paragraphs (a)(5)(i) through (a)(5)(v)of this section.

(i) Installation of the bag leak detection system.

(ii) Initial and periodic adjustment of the bag leak detection system including how the alarm set-point and alarm delay time will be established.

(iii) Operation of the bag leak detection system including quality assurance procedures.

(iv) Maintenance of the bag leak detection system including a routine maintenance schedule and spare parts inventory list.

(v) How the bag leak detection system output will be recorded and stored.

(Ref.: 40 CFR 63.11527(a))

IV.26 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject 40 63.11528 and shall comply with the Performance Testing and Compliance Requirements as follows:

(a) *Initial compliance demonstration deadlines.* The permittee shall conduct an initial Method 22 (appendix A-7 of 40 CFR part 60) test following the requirements of paragraph (b)(1) of this section of each existing electrometallurgical operation control device and an initial Method 9 observation following the requirements of paragraph (c)(1) of this section from the furnace building due to electrometallurgical operations no later than 60 days after your applicable compliance date. For any new electrometallurgical operation control device, the permittee shall conduct an initial Method 22 test following the requirements of paragraph (b)(1) of this section within 15 days of startup of the control device.

(b) *Visible emissions limit compliance demonstration.*

(1) The permittee shall conduct a Method 22 (appendix A-7 of 40 CFR part 60) test to determine that VE from the control device do not exceed the emission standard specified in 40 CFR 63.11526(a). For a fabric filter, conduct the test for at least 60 minutes at the fabric filter monovent or outlet stack(s), as applicable. For a wet scrubber, conduct the test for at least 60 minutes at the outlet stack(s).

(2) The permitee shall conduct a semiannual Method 22 test using the procedures specified in paragraph (b)(1) of this section.

(c) *Furnace building opacity.*

(1) The permittee shall conduct an opacity test for fugitive emissions from the furnace building according to the procedures in 40 CFR 63.6(h) and Method 9 (appendix A-4 of 40 CFR part 60). The test shall be conducted for at least 60 minutes and shall include tapping the furnace or reaction vessel. The observation shall be focused on the part of the building where electrometallurgical operation fugitive emissions are most likely to be observed.

(2) Conduct subsequent Method 9 tests no less frequently than every 6 months and each time the permittee makes a process change likely to increase fugitive emissions.

(3) After the initial Method 9 performance test, as an alternative to the Method 9 performance test, the permittee may monitor VE using Method 22 (appendix A-7 of 40 CFR part 60) for subsequent semi-annual compliance demonstrations. The Method 22 test is successful if no VE are observed for 90 percent of the readings over the furnace cycle (tap to tap) or 60 minutes, whichever is longer. If VE are observed greater than 10 percent of the time over the furnace cycle or 60 minutes, whichever is longer, then the facility shall conduct another test as soon as possible, but no later than 15 calendar days

after the Method 22 test using Method 9 (appendix A-4 of 40 CFR part 60) as specified in paragraph (c)(1) of this section.

(Ref.: 40 CFR 63.11528)

PART V
EMISSION POINT SPECIFIC
RECORDKEEPING AND/OR REPORTING REQUIREMENTS

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Recordkeeping and/or Reporting Requirement
AA-000 *(Entire Facility)*	PSD Construction Permit Issued November 27, 2013	V.1	Performance Testing	Submit Results no later than 60 days following actual test
		V.2	Natural Gas Combustion	Maintain Records and Submit Semi-Annual Records of Usage Rate
		V.3	Silicon Production	Maintain All Records and Submit a Semi-Annual Production Report for each consecutive 12-month period
		V.4	NOx	Maintain All Records and Submit Semi-Annually to Demonstrate Compliance with consecutive 12-month period Individual and Combined Emission Limitations and/or Individual and Combined BACT Emission Limitation
			CO	
			SO2	
			VOC	
			PM/PM10	
			PM2.5	
			HAP	
			GHG (CO2e)	
AA-100 *(Raw Material Receiving and Handling Operations)*	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
		V.6	Material Throughput Rate	Semi-Annual Report the Material Throughput Rate for each consecutive 12 month period
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued November 27, 2013	V.7	NOx	Submit Semi-Annual Report of Emission from CEMs Data
			CO	
			SO2	
		V.8	VOC	Submit Semi-Annual Report of Emissions utilizing Data obtained from Performance Testing
			PM/PM10/ PM2.5	

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Recordkeeping and/or Reporting Requirement
AA-201 *(Submerged Arc Furnaces)*	40 CFR 60.264(c)	V.9	NSPS Subpart Z	Product Change Notification Report
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Maintain and Submit Semi-Annual Reports that the permittee is in compliance with the Dust Control Plan
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued November 27, 2013	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued November 27, 2013	V.10	NOx	Maintain and Submit Semi-Annual Reports of Emissions and Use of Low Sulfur Fuel Oil for each consecutive 12-month period
			CO	
			SO2	
			VOC	
			PM/PM10/ PM2.5	
AA-000 *(Entire Facility)* *where applicable	40 CFR 63.11529(a)	V.11	MACT Subpart YYYYYY	Initial Notification
	40 CFR 63.11529(b)	V.12		Notification of Compliance Status
	40 CFR 63.11529(c)	V.13		Annual Compliance Certification
	40 CFR 63.11529(d) through (g)	V.14		Recordkeeping Requirements

V.1 For Emission Point AA-000 (Entire Facility), the permittee shall submit all required performance testing results no later than 60 days from the actual performance test. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.2 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the natural gas usage limitations and recordkeeping requirements for the previous consecutive 12-month period of the federally enforceable permit herein and for demonstrating that good combustion practices were implemented. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.3 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the Silicon production limitation for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuanace Date)

V.4 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the facility wide and individual BACT limits for NOx, CO, SO2, VOC, PM/PM10/PM2.5, HAP, and GHG (as CO2e) for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.5 For Emission Point AA-100 (Raw Material Receiving and Handling Operations), AA-301 (Silicon Grinding and Milling), AA-403 (Slag Handling and Storage), AA-402 and AA-402a (Unpaved Roads and Paved Roads and Plantwide Transport of Fugitive Emisisons) and AA-404 (Silica Fume Silo), the permittee shall submit semi-annual reports certifying that the permittee implemented and followed its Dust Control Plan for minimizing PM/PM10/PM2.5 emissions for the previous consecutive 12-month period for demonstrating compliance with the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.6 For AA-100 (Raw Material Receiving and Handling Operations), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the Material Throughput Rate Limitation for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.7 For AA-201 (Submerged Arc Furnaces), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the NOx, CO, and SO2 emission rates for the previous consecutive 12-month period of the federally enforceable permit herein, utilizing the CEMS technology data as described and required monitoring in Section IV. If this data is unavailable then the data of the contingency plan will be used to demonstrate compliance so that the permittee can demonstrate its emission rate for these pollutants at any given time to the MDEQ for demonstrating compliance with the individual BACT emission limits.

V.8 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the VOC and PM/PM10/PM2.5 emission limitations for the previous consecutive 12-month period of the federally enforceable permit herein. The permittee shall utilize performance test data and/or operational range data from the performance test and any other data for demonstrating compliance with the emission limitation. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.9 For Emission Point AA-201 (Submerged Arc Furnace), the permitte shall comply with 40 CFR 60, Subpart Z and submit a written report of any product change to the MDEQ no later than 30 days after implementation of the product change. (Ref.: 40 CFR 60.264(c))

V.10 For Emission Point AA-501 (Emergency Generators), the permitee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the NOx, CO, SO2, VOC, PM/PM10/PM2.5 emission limitations of the federally enforceable permit herein for the previous consecutive 12-month period and is using Ultra Low Sulfur Diesel (ULSD) Fuel. (Ref.: PSD Construction Permit Issued November 27, 2013)

V.11 For Emission Point AA-000 (Entire Facility), the permittee shall notify the MDEQ no later than 120 days following startup of the affected source that the permitee is subject to 40 CFR 63 - Subpart YYYYYY as specified by 40 CFR CFR 63.11529(a). (Ref.: 40 CFR 63.11529(a))

V.12 For Emission Point AA-000 (Entire Facility), the permittee shall submit a Notification of Compliance Status within as required by 40 CFR 63.11529(b). This notification must include the following:

(a) The results of Method 22 (appendix A-7 of 40 CFR part 60) test for VE as required by 40 CFR 63.11528(a);

(b) If the permittee has installed a bag leak detection system, documentation that the system satisfies the design requirements specified in 40 CFR 63.11527(a)(3) and that the permittee has prepared a site-specific monitoring plan that meets the requirements specified in 40 CFR 63.11527(a)(5);

(c) The results of the Method 9 (appendix A-4 of 40 CFR part 60) test for building opacity as required by 40 CFR 63.11528(a).

(Ref.: 40 CFR 63.11529(b))

V.13 For Emission Point AA-000 (Entire Facility), the permittee shall comply with 40 CFR 63.11529(c) and submit an annual certification of compliance according to the following:

(a) The results of any daily or weekly visual monitoring events required by 40 CFR 63.11527(a)(1) and (b)(1), alarm-based visual monitoring at sources equipped with bag leak detection systems as required by 40

CFR 63.11527(a)(4), or readings outside of the operating range at sources using CPMS on wet scrubbers required by 40 CFR 63.11527(b)(4).

(b) The results of the follow up Method 22 (appendix A-7 of 40 CFR part 60) tests that are required if VE are observed during the daily or weekly visual monitoring, alarm-based visual monitoring, or out-of-range operating readings as described in paragraph (a) of this section.

(c) The results of the Method 22 (appendix A-7 of 40 CFR part 60) or Method 9 (appendix A-4 of 40 CFR part 60) tests required by 40 CFR 63.11528(b) and (c), respectively.

(d) If the permittee operates a bag leak detection system for a fabric filter or a CPMS for a wet scrubber, submit annual reports according to the requirements in 40 CFR 63.10(e) and include summary information on the number, duration, and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero and span or other calibration checks, if applicable).

V.14 For Emission Point AA-000 (Entire Facility), the permittee shall keep records as specified in 40 CFR 63.11529(d) through (g) as follows for demonstrating complying with the Recordkeeping Requirements of 40 CFR 63-Subpart YYYYYY:

(a) The permittee shall keep the records specified in paragraphs (a)(1) through (a)(2) of this section.

(1) As required in 40 CFR 63.10(b)(2)(xiv), the permittee shall keep a copy of each notification that the permittee submitted to comply with this subpart and all documentation supporting any Initial Notification, Notification of Compliance Status, and annual compliance certifications that you submitted.

(2) You shall keep the records of all daily or weekly visual, Method 22 (appendix A-7 of 40 CFR part 60), and Method 9 (appendix A-4 of 40 CFR part 60) monitoring data required by 40 CFR 63.11527 and the information identified in paragraphs (a)(2)(i) through (a)(2)(v) of this section.

(i) The date, place, and time of the monitoring event;
(ii) Person conducting the monitoring;
(iii) Technique or method used;
(iv) Operating conditions during the activity; and
(v) Results, including the date, time, and duration of the period from the time the monitoring indicated a problem (e.g., VE) to the time that monitoring indicated proper operation.

(b) The permittee's records must be in a form suitable and readily available for expeditious review, according to 40 CFR 63.10(b)(1).

(c) As specified in 40 CFR 63.10(b)(1), The permittee shall keep each record for 5 years following the date of each recorded action.

(d) The permittee shall keep each records onsite for at least 2 years after the date of each recorded action according to 40 CFR 63.10(b)(1). The permittee shall keep the records offsite for the remaining 3 years.

(Ref.: 40 CFR 63.11529(d) through (g))

MINUTES OF THE MISSISSIPPI ENVIRONMENTAL QUALITY PERMIT BOARD
HELD IN JACKSON, MISSISSIPPI, ON TUESDAY, DECEMBER 10, 2013

The Mississippi Environmental Quality Permit Board held a meeting in the Commission Hearing Room of the Department of Environmental Quality, located at 515 East Amite Street, on December 10, 2013. Mr. Dennis Riecke called the meeting to order at 9:00 a.m. with the following members and designated representatives present:

Dennis Riecke, Chairman
Melissa Parker for Leslie Royals
Jan Boyd for Jamie Miller
Michael Bograd
Jamie Crawford for Kay Whittington
Jim Lipe for Cindy Hyde-Smith
David Snodgrass for Lisa Ivshin
Benny French was absent

Ted Lampton was present as legal counsel. On motion by Jim Lipe and seconded by Mike Bograd, the minutes of the regular meeting on November 12, 2013, were approved.

THE PERMIT BOARD CONSIDERED THE FOLLOWING OFFICE OF POLLUTION CONTROL MATTERS:

Environmental Permits Division/Solid Waste & Mining Branch
Trashhunters Inc., City of Durant Landfill

Charity Rockingham of the Environmental Permits Division presented information to the Board regarding the reissuance of the wastewater pretreatment permit for the Durant Landfill located in Holmes County, Mississippi. Ms. Rockingham stated that the landfill has been closed now for 10 years and that State and Federal regulations require the owner of a landfill to maintain the site for a minimum of 30 years after the site is closed. The permit will allow Trashhunters to transport and dispose of leachate up to 40,000 gallons per month at the Durant wastewater treatment plant. Ms. Rockingham stated that a public hearing was held on October 8, 2013, in Durant and there were no comments received during this hearing. The Compliance and Enforcement Division has conducted an inspection and there were no violations found. Staff has reviewed the application and has determined that it is complete and in accordance with state and federal regulations.

The Permit Board, on motion by Jamie Crawford and seconded by Jim Lipe accepted the staff's recommendation to approve the application for permit reissuance.

THE PERMIT BOARD CONSIDERED THE FOLLOWING OFFICE OF GEOLOGY MATTERS:

EXHIBIT "2"

Mining and Reclamation Division

The Permit Board, on motion by Jim Lipe and seconded by David Snodgrass

REPORT OF STAFF PERMIT ACTIONS/CERTIFICATIONS

Staff reported to the Permit Board that staff had taken action on various permits since the November 12, 2013, Permit Board Meeting pursuant to the regulations delegating this authority to the Executive Director and the Executive Director's delegation of this authority to the staff in accord with those regulations. The Permit Board voted to note and record in its minutes the reports of permit actions/certifications by staff since the November 12, 2013, Permit Board Meeting. [Jamie Crawford abstained from voting on all Land and Water Resources permits and Mike Bograd abstained on all of the Office of Geology permits.]

REPORT OF PERMIT ACTIONS / CERTIFICATIONS SINCE THE 11/12/2013 MEETING OFFICE OF POLLUTION CONTROL ENVIRONMENTAL PERMITS DIVISION

Air - Construction PSD Permit Issuance

ID	Facility	County	Permit No.
64456	Mississippi Silicon LLC	Tishomingo	2640-00060

Air - Construction Permit Issuance

ID	Facility	County	Permit No.
19548	Amory Bulk Terminal, Kinder Morgan Amory LLC	Monroe	1840-00080
64336	Dunolie Resources Inc	Winston	2980-00038
63394	Gulf South Pipeline Company LP, Jasper Compressor Station	Jasper	1300-00079
23521	LDC Commodities River Elevators LLC	Bolivar	0240-00097
2068	Mississippi Phosphates Corporation	Jackson	1280-00044

Air - Permit Revoke

ID	Facility	County	Permit No.
1099	Griffin Industries LLC	Hinds	1080-00040
966	Sanderson Plumbing Products Inc	Lowndes	168000004
11051	Transferred To: Renin US LLC, A Division of Renin CorporationTransferred From: Home Decor Innovation, A Division of the Renin Corporation	Lee	1540-00025

Air - Synthetic Minor Operating Permit Issuance

ID	Facility	County	Permit No.
64336	Dunolie Resources Inc	Winston	2980-00038
154	Genesis Rail Services LLC, Natchez Terminal	Adams	0040-00054
23521	LDC Commodities River Elevators LLC	Bolivar	0240-00097

Air - Title V Operating Permit Issuance

ID	Facility	County	Permit No.
9039	Bunge-Ergon Vicksburg, LLC	Warren	2760-00107
35025	Mississippi Hub LLC, Natural Gas Transmission Facility	Simpson	2480-00070

Surface Water - General Permit Coverages - Other Issuances			
ID	Facility	County	Permit No.
64890	Chad McCarty, Poultry	Jasper	MSG201736
64932	Denbury Onshore LLC, EHFU Bulk and Production Lines	Jasper	MSG130409
15718	Donald W Sellers, Poultry	Wayne	MSG200599
50121	Gary Thornton, Poultry	Smith	MSG201154
64053	Greenleaf CO2 Solutions LLC, WYC to Pachuta Greenleaf CO2 Pipeline	Clarke	MSG130405
64913	Gulf South Pipeline Company LP, Hydrostatic Test Discharge PN 4022	Hinds	MSG130406
64919	Gulf South Pipeline Company LP, Hydrostatic Test Discharge PN 4899	Warren	MSG130408
7220	Mark D Johnson, Poultry	Leake	MSG201322
55404	Neel Schaffer Inc, Former Pugh City Grocery	Leflore	MSG120226
27110	PPM Consultants Inc, Shop A Mint Junior Number 2	Claiborne	MSG120225
40456	Pattan Farms	Walthall	MSG200108
25693	Summit Environmental Group Inc, Tims Amoco	Perry	MSG120227
64821	Wicker Motel	Smith	MSG201734

Surface Water - General Permit Coverages - Other Modification			
ID	Facility	County	Permit No.
1621	Dunn Roadbuilders LLC, Laurel Plant	Jones	MSR700051
6278	Mallette Brothers Construction Company Inc	Jackson	MSR700038
58185	Superior Asphalt Inc, Panola County Plant Number One	Panola	MSR700103
55032	Todd Livingston, Poultry	Jasper	MSG201642

Surface Water - General Permit Coverages - Storm Water Issuance			
ID	Facility	County	Permit No.
64970	4 County Electric Power Association, Triathlon Substation	Clay	MSR106507
64936	Alcorn County Board of Supervisors, SAP 02(64)	Alcorn	MSR106499
64940	Camping World, Olive Branch	Desoto	MSR106500
64749	Clarke County Board of Supervisors, Clarke County Center	Clarke	MSR106474
17235	Cypress Creek Subdivision	Harrison	MSR106464
64336	Dunollie Resources Inc	Winston	MSR002149
52942	Elizabeth Roberts, Crawfish Ponds	Jackson	MSR106483
53769	Great Southern Wood Brookhaven Inc	Lincoln	MSR002114
64729	John Nelson, Nelson Mine	Forrest	MSR322351
54589	KiOR Inc	Lowndes	MSR106506
23197	Kyles Creek Subdivision	Desoto	MSR106455
64645	Loves Travel Stops and Country Stores Inc, Indianola	Sunflower	MSR106466
54892	Lyle Machinery Company, Summit	Pike	MSR106484
64961	MDOT, Jones, 105120 301000	Jones	MSR106503
64900	MDOT, Lafayette, 108296 301000	Lafayette	MSR106490
64901	MDOT, Marshall, 100299 301000	Marshall	MSR106491
64884	MDOT, Marshall, 102556 308000	Marshall	MSR106481
64896	MDOT, Pearl River Lamar Forrest, 106594 301 302 303	Lamar	MSR106488
64922	Mississippi Power Company, Gatlin Road Storm Water Project	Wayne	MSR106492

84430	Yokohama Tire Corporation	Clay	MSR108448

Surface Water - General Permit Coverages - Storm Water Modification			
ID	Facility	County	Permit No.
84620	Eutaw Construction Company Inc, Chandler Mine	Clay	MSR322339
55622	Joe McGee Construction Company Inc, Herrington Mine	Madison	MSR322107
56237	Joe McGee Construction Company Inc, Shackleford Mine	Madison	MSR322139
16392	Reunion Development	Madison	MSR101983
11051	Transferred To: Renin US LLC, A Division of Renin CorporationTransferred From: Home Decor Innovation, A Division of the Renin Corporation	Lee	MSR110036

Surface Water - General Permit Coverages - Storm Water Reissuance			
ID	Facility	County	Permit No.
36998	APAC Mississippi Inc, Tremont Pit Sand and Gravel	Itawamba	MSR321776
38313	Parker Sand and Gravel	Lowndes	MSR321823

Surface Water - General Permit Coverages - Storm Water Transfer			
ID	Facility	County	Permit No.
38307	Transferred To: Busbys Digging Service LLC, Crechale MineTransferred From: Neely Trucking and Excavating Company, Crechale Mine	Rankin	MSR321822

Surface Water - Commercial - NPDES Permit Issuance			
ID	Facility	County	Permit No.
15810	Joy Enterprise dba Southern Mobile Home and RV Park	Lauderdale	MS0044024

Surface Water - Commercial - NPDES Permit Reissuance			
ID	Facility	County	Permit No.
13744	B and G Utilities Inc, Brookwood Subdivision	Hinds	MS0031194
14265	Boatman Trailer Park	Clay	MS0051446
14382	Hunter Ridge Trailer Park, Hunter Ridge Estates	Oktibbeha	MS0055191
14190	Magnolia Mobile Home Park LLC	Panola	MS0048852
13686	Monroe County Schools, Hamilton High School	Monroe	MS0029246
18482	Ring Road Utility Company Inc, Woodland Hills Development	Warren	MS0059161
14039	US Army COE, Sardis Lower Lake Recreation	Panola	MS0043737
13927	Wallman Hall Inc, Country Junction Truck Stop	Copiah	MS0038873
14319	Woods Utility LLC, The, The Woods Subdivision, Phase Two	Lamar	MS0053511

Surface Water - Commercial NPDES Permit - Revoke			
ID	Facility	County	Permit No.
13744	B and G Utilities Inc, Brookwood Subdivision	Hinds	MS0031194
14265	Boatman Trailer Park	Clay	MS0051446
14249	Family Fish House	Copiah	MS0050971
14870	Hancock County Schools, East Hancock Elementary School	Hancock	MS0057070
14382	Hunter Ridge Trailer Park, Hunter Ridge Estates	Oktibbeha	MS0055191
14190	Magnolia Mobile Home Park LLC	Panola	MS0048852
13686	Monroe County Schools, Hamilton High School	Monroe	MS0029246
18482	Ring Road Utility Company Inc, Woodland Hills Development	Warren	MS0059161

6235	Burrows Paper Corporation	Holmes	MS0000795
7411	Fortenberrys Meat Plant	Walthall	MS0037184
1639	Georgia Pacific Wood Products LLC, Columbia	Marion	MS0002208
6493	Jackson County Port Authority, Moss Point Industrial and Technology Park	Jackson	MS0002674
1358	Motiva Enterprises LLC, Collins Terminal	Covington	MS0002968
1373	National Aeronautics and Space Administration, Mississippi Army Ammunition Plant	Hancock	MS0040797
2185	SABIC Innovative Plastics US LLC	Hancock	MSS062057
2339	Texas Gas Transmission LLC, Greenville Compressor Station	Washington	MS0046574

Surface Water - Industrial - NPDES Permit Transfer			
ID	Facility	County	Permit No.
218	Transferred To: Adams County WWTFTransferred From: Rentech	Adams	MS0000213

Surface Water - Industrial - Pretreatment Permit - Revoke			
ID	Facility	County	Permit No.
1755	Peavey Electronics Corporation, Plant Number 7	Newton	MSP090185
11051	Transferred To: Renin US LLC, A Division of Renin CorporationTransferred From: Home Decor Innovations, A Division of the Renin Corporation	Lee	MSP090372

Surface Water - Industrial - Pretreatment Permit Reissuance			
ID	Facility	County	Permit No.
1696	Greenfield Environmental Multistate Trust LLC	Lowndes	MSP090021
1937	Kemira Chemicals Inc	Monroe	MSP090826
5665	Plaskolite South LLC	Desoto	MSP092201

Surface Water - Industrial - State Operating Permit Issuance			
ID	Facility	County	Permit No.
2008	Mid South Lumber Inc	Lauderdale	MSU213002

Surface Water - Industrial - State Operating Permit Reissuance			
ID	Facility	County	Permit No.
17723	Coleman Funeral Home	Lafayette	MSU030161
17369	R and A Development Inc, Windchase Community	Oktibbeha	MSU020157

Surface Water - Industrial General Permit Coverage - Stormwater - Transfer			
ID	Facility	County	Permit No.
1937	Transferred To: Kemira Chemicals IncTransferred From: 3F Chimica Americas Inc	Monroe	MSR000898

Surface Water - Industrial General Permit Coverage - Revoke			
ID	Facility	County	Permit No.
37476	APAC Mississippi Inc, Ozburn Mine	Itawamba	MSR321828
53944	Eutaw Construction Company Inc, Griffin Mine	Hinds	MSR322023
58099	Pickett Industries LLC, Simrall Mine	Warren	MSR322220
62607	Pierce Construction and Contract Hauling Inc, Sullivan Mine	Rankin	MSR322245
907	Raytheon Company	Scott	MSR105801
49221	Southern Rock LLC, Tucker Mine	Madison	MSR321889

Surface Water - Municipal - NPDES Permit Reissuance			
ID	Facility	County	Permit No.
13013	Arcola POTW	Washington	MS0037311
13059	Centreville POTW, North	Wilkinson	MS0025488
13094	Crowder POTW	Quitman	MS0034304
13152	Goodman POTW	Holmes	MS0026921
13177	Hazlehurst POTW, Activated Sludge	Copiah	MS0023922
13216	Lambert POTW	Quitman	MS0020231
13231	Lucedale POTW	George	MS0044504
13260	Mendenhall POTW	Simpson	MS0021539
13448	Wesson POTW	Copiah	MS0023779
13452	West POTW	Holmes	MS0032816
13455	Winona POTW	Montgomery	MS0021024
13458	Woodville POTW	Wilkinson	MS0054640

Surface Water - Water Quality - Issue 401 Certification			
ID	Facility	County	Permit No.
64600	Diamondhead, City of, Dredging Paradise Bayou and Associated Canals	Hancock	WQC2013033
63791	Hancock County Board of Supervisors, Devils Elbow Maintenance and Dredging	Hancock	WQC2013015
24223	Pearl, City of, Bass Pro Drive	Rankin	WQC2004071
20034	Riverwind Development, Riverwind West	Rankin	WQC2005045

REPORT OF ACTIONS/CERTIFICATIONS SINCE THE 11/12/13 MEETING
OFFICE OF GEOLOGY
MINING AND RECLAMATION DIVISION

Permit(s) Issued			
ID	Facility	County	Permit No.
64620	Eutaw Construction Company Inc, Chandler Mine	Clay	P13-022
64734	W S Newell and Sons Inc, Callicutt Mine One	Marshall	P13-024
64737	W S Newell and Sons Inc, Medley Mine	Marshall	P13-025

Permit(s) Modified with Acreage			
ID	Facility	County	Permit No.
55622	Joe McGee Construction Company Inc, Harrington Mine	Madison	P11-018A
57363	Warren Excavation LLC, JNL Land and Pine Number 1 Mine	Madison	P13-017A

Permit(s) Reissued			
ID	Facility	County	Permit No.
22887	Green Brothers Gravel Company Inc, Brent Pit	Copiah	P09-005A
8801	Harold Lee and Sons Lime Company Inc, Lime Mine	Noxubee	P79-004
18354	KBR Enterprises, LLC	Pearl River	P04-012T
18355	KBR Enterprises, LLC	Pearl River	P04-011T
18637	Tillery Properties LLC, Tillery Pit	Jones	P04-002A

OFFICE OF LAND AND WATER RESOURCES
REPORT OF PERMIT ACTIONS/CERTIFICATIONS SINCE THE 11/12/13 MEETING
GROUND WATER SECTION

OWNER NAME	COUNTY	VOLUME (MGD)	VOLUME (AF/YR)	RATE (GPM)	SOURCE	PERMIT NUMBER	AGENCY
Groundwater Applications							
CENTER WATER ASSOCIATION INC	PEARL RIVER	0.26	291	500	MOCN	MS-GW-17115	DEQ
WELLSGATE OWNERS ASSOCIATION	LAFAYETTE	0.27	302	250	MUWX	MS-GW-17123	DEQ
WALKER, KEITH	BOLIVAR	0.63	702	1400	MRVA	MS-GW-41670	YMD
ROBERTSON, HUBERT O	SUNFLOWER	0.11	120	1800	MRVA	MS-GW-43824	YMD
ROBERTSON, HUBERT O	SUNFLOWER	0.11	120	1800	MRVA	MS-GW-43825	YMD
G A ROBINSON LAND COMPANY	HUMPHREYS	0.64	716	3000	MRVA	MS-GW-44917	YMD
JONES III, BRIAN	HOLMES	0.18	198	2500	MRVA	MS-GW-46324	YMD
JONES III, BRIAN	HOLMES	0.03	38	700	MRVA	MS-GW-46325	YMD
SELMAN, WENDY	LEFLORE	0.08	90	2000	MRVA	MS-GW-47622	YMD
FARMERS NATIONAL	COAHOMA	0.11	120	2500	MRVA	MS-GW-47625	YMD
FARMERS NATIONAL	COAHOMA	0.18	204	2500	MRVA	MS-GW-47626	YMD
FARMERS NATIONAL	COAHOMA	0.09	99	2500	MRVA	MS-GW-47627	YMD
USFWS	QUITMAN	0.07	80	1200	MRVA	MS-GW-47679	YMD
LONG, BUDDY	BOLIVAR	0.05	60	2500	MRVA	MS-GW-47680	YMD
LAKELAND PLANTATION INC	HOLMES	0.12	131	2000	MRVA	MS-GW-47681	YMD
BURKEEN, SHANNON	YAZOO	0.12	135	2500	MRVA	MS-GW-47682	YMD
SCHIMMEL, GEORGE AND CONNIE	SHARKEY	0.07	75	1200	MRVA	MS-GW-47683	YMD
SANDY BAYOU FARMS	SHARKEY	0.11	128	1200	MRVA	MS-GW-47684	YMD
JONES, W E, TESTAMENTARY TRUST	HUMPHREYS	0.13	150	2800	MRVA	MS-GW-47688	YMD
MSU FOUNDATION INC	LEFLORE	0.15	165	1500	MRVA	MS-GW-47689	YMD
MSU FOUNDATION INC	LEFLORE	0.07	75	3000	MRVA	MS-GW-47690	YMD
WILLIAMS FARM	TUNICA	0.07	75	800	MRVA	MS-GW-47701	YMD

BILBO FARMS	PANOLA	0.10	110	1600	MRVA	MS-GW-47702	YMD
GRAVES, NICK	TUNICA	0.04	45	850	MRVA	MS-GW-47703	YMD
CYPRESS PLANTING COMPANY	BOLIVAR	0.02	23	750	MRVA	MS-GW-47705	YMD
ROBERTS FARMS INC	HUMPHREYS	0.12	135	1250	MRVA	MS-GW-47706	YMD
ROBERTS FARMS INC	HUMPHREYS	0.09	99	1250	MRVA	MS-GW-47707	YMD
ROBERTS FARMS INC	HUMPHREYS	0.13	150	2500	MRVA	MS-GW-47708	YMD
ROBERTS FARMS INC	HUMPHREYS	0.13	147	2500	MRVA	MS-GW-47709	YMD
IRELAND, BILL	WASHINGTON	0.25	278	2500	MRVA	MS-GW-47710	YMD
IRELAND, BILL	WASHINGTON	0.23	263	2500	MRVA	MS-GW-47711	YMD
IRELAND, BILL	WASHINGTON	0.19	213	2500	MRVA	MS-GW-47712	YMD
MATTSON FARMS	TUNICA	0.29	326	2300	MRVA	MS-GW-47713	YMD
FLOWERS, MARY EGGLESTON	COAHOMA	0.16	180	1500	MRVA	MS-GW-47714	YMD
HALE, STEPHEN R	QUITMAN	0.04	42	800	MRVA	MS-GW-47715	YMD
HALE, THOMAS M	QUITMAN	0.04	42	800	MRVA	MS-GW-47716	YMD
BYRD, SHERIDAN W	PANOLA	0.26	288	2500	MRVA	MS-GW-47717	YMD
R D HINES INC	HUMPHREYS	0.13	150	450	MRVA	MS-GW-47718	YMD
R D HINES INC	HUMPHREYS	0.08	87	450	MRVA	MS-GW-47719	YMD
PRUDEN, IDA DELEANE	HUMPHREYS	0.10	116	2500	MRVA	MS-GW-47720	YMD
SHEA LEATHERMAN LLC	TUNICA	0.10	117	3000	MRVA	MS-GW-47722	YMD
MAMA BEAR LLC ET AL	TUNICA	0.08	86	3000	MRVA	MS-GW-47723	YMD
HARDEMAN, R T AND E T	LEFLORE	0.13	143	2500	MRVA	MS-GW-47724	YMD
HARDEMAN, R T AND E T	LEFLORE	0.13	146	2500	MRVA	MS-GW-47725	YMD
HARDEMAN, R T AND E T	LEFLORE	0.08	84	2500	MRVA	MS-GW-47726	YMD
TADPOLE FARMS	YAZOO	0.17	195	2500	MRVA	MS-GW-47727	YMD
WEST INC	HOLMES	0.10	116	1500	MRVA	MS-GW-47728	YMD
JAMES COLEMAN INC	YAZOO	0.25	276	2500	MRVA	MS-GW-47729	YMD
COGHLAN PROPERTIES LLC	SHARKEY	0.31	345	2500	MRVA	MS-GW-47730	YMD
WHITEHEAD, J D	ISSAQUENA	0.05	51	1200	MRVA	MS-GW-47731	YMD

SPP LLC	SUNFLOWER	0.35	396	1500	MRVA	MS-GW-47733	YMD
TRI STATE PROPERTIES INC	TUNICA	0.15	165	3000	MRVA	MS-GW-47734	YMD
TRI STATE PROPERTIES INC	DESOTO	0.16	180	1100	MRVA	MS-GW-47735	YMD
TRI STATE PROPERTIES INC	DESOTO	0.16	180	3000	MRVA	MS-GW-47736	YMD
MAUD FARMS	TUNICA	0.09	105	2200	MRVA	MS-GW-47737	YMD
MAUD FARMS	TUNICA	0.05	51	2200	MRVA	MS-GW-47738	YMD
MAUD FARMS	TUNICA	0.12	131	1600	MRVA	MS-GW-47739	YMD
MISSISSIPPI MUDD INC	WASHINGTON	0.15	165	1500	MRVA	MS-GW-47740	YMD
MISSISSIPPI MUDD INC	WASHINGTON	0.30	336	2000	MRVA	MS-GW-47741	YMD
S AND N FARMS INC	WASHINGTON	0.20	225	2500	MRVA	MS-GW-47743	YMD
S AND N FARMS INC	WASHINGTON	0.07	83	2500	MRVA	MS-GW-47744	YMD
HIRSBERG, GEORGE	COAHOMA	0.02	25	800	MRVA	MS-GW-47745	YMD
WILLIAMS, LONNY	COAHOMA	0.04	45	800	MRVA	MS-GW-47746	YMD
YOUNG JR, W E	COAHOMA	0.10	110	2200	MRVA	MS-GW-47747	YMD
YOUNG JR, W E	COAHOMA	0.02	17	800	MRVA	MS-GW-47748	YMD
DURST, MARGARET	SHARKEY	0.33	375	1800	MRVA	MS-GW-47749	YMD
SOUTH DELTA SCHOOL DISTRICT	SHARKEY	0.16	180	1800	MRVA	MS-GW-47750	YMD
MAMA BEAR LLC ET AL	TUNICA	0.07	83	3000	MRVA	MS-GW-47751	YMD
BIG SLOUGH HUNTING CLUB LLC	ISSAQUENA	0.004	4	600	MRVA	MS-GW-47752	YMD
JWBMS LLC	WASHINGTON	0.37	414	2500	MRVA	MS-GW-47755	YMD
JWBMS LLC	WASHINGTON	0.22	249	2500	MRVA	MS-GW-47756	YMD
JWBMS LLC	WASHINGTON	0.38	429	2500	MRVA	MS-GW-47757	YMD
STEELE LAND TRUST 2010	WASHINGTON	0.17	192	3000	MRVA	MS-GW-47759	YMD
HARRIS, BILLY R	WASHINGTON	0.40	452	2400	MRVA	MS-GW-47775	YMD
DARNELL, RUTH ANN	ISSAQUENA	0.06	71	2500	MRVA	MS-GW-47799	YMD
DARNELL, RUTH ANN	ISSAQUENA	0.11	119	2500	MRVA	MS-GW-47800	YMD
DARNELL, RUTH ANN	ISSAQUENA	0.14	158	2500	MRVA	MS-GW-47801	YMD

Groundwater Modifications

CENTER WATER ASSOCIATION INC	PEARL RIVER	0.15	168	278	PCGLL	MS-GW-01030	DEQ
CENTER WATER ASSOCIATION INC	PEARL RIVER	0.18	202	325	PCGLU	MS-GW-01031	DEQ
UTILITY SERVICES LLC	HANCOCK	0.08	90	125	PCGLL	MS-GW-01826	DEQ
SWAREK, THOMAS	YAZOO	0.30	340	1200	MRVA	MS-GW-04140	YMD
R D HINES INC	HUMPHREYS	0.13	140	1400	MRVA	MS-GW-07494	YMD
DUNN FARMS	LEFLORE	0.24	273	2400	MRVA	MS-GW-09414	YMD
PRATHER FARMS	WASHINGTON	0.16	180	1500	MRVA	MS-GW-11637	YMD
DUNN FARMS	LEFLORE	0.19	210	1200	MRVA	MS-GW-12181	YMD
HARDEMAN, R T AND E T	LEFLORE	0.16	179	1900	MRVA	MS-GW-12307	YMD
UTILITY SERVICES LLC	JACKSON	0.13	146	350	GRMFL	MS-GW-13085	DEQ
UTILITY SERVICES LLC	JACKSON	0.13	146	350	GRMFL	MS-GW-13086	DEQ
UTILITY SERVICES LLC	HARRISON	0.01	11	194	GRMFL	MS-GW-13087	DEQ
UTILITY SERVICES LLC	HARRISON	0.01	11	188	GRMFL	MS-GW-13088	DEQ
UTILITY SERVICES LLC	HANCOCK	0.06	67	200	PCGLU	MS-GW-13092	DEQ
UTILITY SERVICES LLC	HARRISON	0.14	157	425	GRMFL	MS-GW-13098	DEQ
CENTER WATER ASSOCIATION INC	PEARL RIVER	0.19	213	350	PCGLL	MS-GW-15117	DEQ
UTILITY SERVICES LLC	JACKSON	0.18	202	468	GRMFL	MS-GW-15302	DEQ
UTILITY SERVICES LLC	JACKSON	0.19	213	512	GRMFL	MS-GW-15303	DEQ
UTILITY SERVICES LLC	JACKSON	0.13	146	400	GRMFL	MS-GW-15329	DEQ
CENTER WATER ASSOCIATION INC	PEARL RIVER	0.22	246	400	PCGLL	MS-GW-15452	DEQ
UTILITY SERVICES LLC	JACKSON	0.09	101	250	GRMFL	MS-GW-15702	DEQ
UTILITY SERVICES LLC	JACKSON	0.02	22	200	GRMFU	MS-GW-15703	DEQ
UTILITY SERVICES LLC	HARRISON	0.09	101	290	GRMFL	MS-GW-15704	DEQ
UTILITY SERVICES LLC	HANCOCK	0.01	11	350	GRMFU	MS-GW-15909	DEQ
UTILITY SERVICES LLC	HARRISON	0.02	22	350	GRMFL	MS-GW-15910	DEQ
CRENSHAW, HAL D	QUITMAN	0.41	459	1500	MRVA	MS-GW-36741	YMD
DUNN FARMS	LEFLORE	0.16	177	3000	MRVA	MS-GW-37550	YMD

CRENSHAW, BOB	QUITMAN	0.29	330	2000	MRVA	MS-GW-43424	YMD
CRENSHAW, HAL	QUITMAN	0.20	225	3000	MRVA	MS-GW-46116	YMD
CRENSHAW BROS	QUITMAN	0.12	135	1200	MRVA	MS-GW-46117	YMD
CRENSHAW JR, BOB D	QUITMAN	0.11	120	3000	MRVA	MS-GW-46118	YMD
CRENSHAW, HAL D	QUITMAN	0.31	342	3000	MRVA	MS-GW-46119	YMD
CRENSHAW, HAL	QUITMAN	0.29	330	2500	MRVA	MS-GW-46122	YMD
WHITEHEAD, J D	ISSAQUENA	0.11	120	2500	MRVA	MS-GW-46478	YMD
CRENSHAW BROTHERS INC	PANOLA	0.27	300	1000	MRVA	MS-GW-46547	YMD
MISSISSIPPI MUDD INC	WASHINGTON	0.09	105	3000	MRVA	MS-GW-47228	YMD
Groundwater Renewals							
FARMERS NATIONAL	COAHOMA	0.37	411	2500	MRVA	MS-GW-00130	YMD
FORD, WALTER ALLAN	WASHINGTON	0.22	250	2000	MRVA	MS-GW-02708	YMD
PEBOCA PARTNERSHIP	HUMPHREYS	0.18	200	1500	MRVA	MS-GW-03797	YMD
PEBOCA PARTNERSHIP	HUMPHREYS	0.27	300	1500	MRVA	MS-GW-03798	YMD
WADE, MRS R T, ESTATE	LEFLORE	0.22	248	1000	MRVA	MS-GW-03860	YMD
WADE, MRS R T, ESTATE	LEFLORE	0.14	152	1000	MRVA	MS-GW-03861	YMD
BERG, DELANO R	COAHOMA	0.52	584	3000	MRVA	MS-GW-06585	YMD
BERG, DELANO R	COAHOMA	0.48	540	3000	MRVA	MS-GW-06586	YMD
BERG, DELANO R	COAHOMA	0.39	435	2000	MRVA	MS-GW-06587	YMD
PLEASANT FARMS INC	SUNFLOWER	0.21	240	800	MRVA	MS-GW-06628	YMD
EAST BANK PLANTATION I LP	HOLMES	0.17	185	800	MRVA	MS-GW-06931	YMD
EAST BANK PLANTATION I LP	HOLMES	0.25	281	900	MRVA	MS-GW-06932	YMD
EAST BANK PLANTATION I LP	HOLMES	0.65	724	2600	MRVA	MS-GW-06933	YMD
WIGGINS, ROBERTA S	BOLIVAR	0.52	585	2000	MRVA	MS-GW-07125	YMD
ROBERTS FARMS INC	HUMPHREYS	0.06	65	2000	MRVA	MS-GW-07220	YMD
USFWS	TALLAHATCHIE	0.12	135	2000	MRVA	MS-GW-07459	YMD
USFWS	TALLAHATCHIE	0.09	100	2000	MRVA	MS-GW-07460	YMD

USFWS	TALLAHATCHIE	0.16	180	2000	MRVA	MS-GW-07461	YMD
USFWS	TALLAHATCHIE	0.09	104	2800	MRVA	MS-GW-07492	YMD
YAZOO RIVER PROPERTIES LLC	HUMPHREYS	0.21	240	2500	MRVA	MS-GW-07659	YMD
MDOC	SUNFLOWER	0.04	45	3000	MRVA	MS-GW-08959	YMD
HALBROOK, DAVID M	HUMPHREYS	0.29	320	2000	MRVA	MS-GW-09145	YMD
AMERICAS CATCH INC	LEFLORE	0.15	168	2000	MRVA	MS-GW-09938	YMD
AMERICAS CATCH INC	LEFLORE	0.37	420	3000	MRVA	MS-GW-09939	YMD
AMERICAS CATCH INC	LEFLORE	0.35	389	3000	MRVA	MS-GW-09940	YMD
GRIFFITH SR, WILLIAM M, TRUST	BOLIVAR	0.11	123	2000	MRVA	MS-GW-11169	YMD
DUNN, JAMES	LEFLORE	0.27	303	1500	MRVA	MS-GW-11559	YMD
DUNN, JAMES	LEFLORE	0.41	458	1700	MRVA	MS-GW-11655	YMD
DUNN, JAMES	LEFLORE	0.29	328	1200	MRVA	MS-GW-11656	YMD
DUNN, JAMES	LEFLORE	0.41	462	1550	MRVA	MS-GW-11729	YMD
POLK REALTY	PANOLA	0.12	135	1100	MRVA	MS-GW-11784	YMD
POLK REALTY	PANOLA	0.18	200	1100	MRVA	MS-GW-11785	YMD
POLK REALTY	PANOLA	0.16	180	1000	MRVA	MS-GW-11786	YMD
POLK REALTY	PANOLA	0.16	180	1000	MRVA	MS-GW-11787	YMD
BERG, DELANO R	COAHOMA	0.16	180	1000	MRVA	MS-GW-13461	YMD
HARRIS FAMILY LTD PRTSHP	SHARKEY	0.16	180	2500	MRVA	MS-GW-14068	YMD
DUNAVANT JR, WILLIAM B	YALOBUSHA	0.01	10	200	MUWX	MS-GW-14442	DEQ
USFWS	QUITMAN	0.18	200	3000	MRVA	MS-GW-14815	YMD
CHISOLM, ZELMA	HOLMES	0.07	78	300	CCKF	MS-GW-15956	DEQ
CHISOLM, ZELMA	HOLMES	0.24	269	1000	CCKF	MS-GW-16021	DEQ
DUNAVANT FARMS INC	TALLAHATCHIE	0.13	144	2500	MRVA	MS-GW-36171	YMD
HARRIS FAMILY LTD PRTSHP	ISSAQUENA	0.15	171	2500	MRVA	MS-GW-36222	YMD
F AND R REGINELLI FARMS	BOLIVAR	0.30	336	2000	MRVA	MS-GW-36230	YMD
BENZ JR, RICHARD	LEFLORE	0.16	180	3000	MRVA	MS-GW-36285	YMD
NEWCOMB, JOHN N	HOLMES	0.41	459	1700	MRVA	MS-GW-37207	YMD

NEWCOMB, JOHN N	HOLMES	0.34	381	1400	MRVA	MS-GW-37208	YMD
COPE JR, WILLIAM DELOACH	WASHINGTON	0.15	171	2000	MRVA	MS-GW-37903	YMD
MUZZI, VINCE	BOLIVAR	0.15	165	2500	MRVA	MS-GW-38046	YMD
LINDSEY, JAMES A	BOLIVAR	0.17	186	1300	MRVA	MS-GW-38101	YMD
LINDSEY, JAMES A	BOLIVAR	0.12	138	1350	MRVA	MS-GW-38104	YMD
BERG, DELANO R	COAHOMA	0.42	467	2500	MRVA	MS-GW-38125	YMD
PRATHER FARMS	BOLIVAR	0.38	423	2000	MRVA	MS-GW-39168	YMD
BRASWELL ENTERPRISES	HUMPHREYS	0.40	445	2000	MRVA	MS-GW-39329	YMD
RTG LLC	QUITMAN	0.19	210	2500	MRVA	MS-GW-39333	YMD
LELAND SCHOOL DISTRICT	WASHINGTON	0.21	240	2500	MRVA	MS-GW-39410	YMD
LELAND SCHOOL DISTRICT	WASHINGTON	0.21	240	2500	MRVA	MS-GW-39411	YMD
GRAVES PLACE LLC	HOLMES	0.46	510	3000	MRVA	MS-GW-39424	YMD
LINDSEY, JAMES A	BOLIVAR	0.16	180	2000	MRVA	MS-GW-39441	YMD
WEST, NOLAN	PANOLA	0.26	291	2000	MRVA	MS-GW-39460	YMD
DUNN, JAMES	LEFLORE	0.33	375	2500	MRVA	MS-GW-39497	YMD
DUNN, JAMES	LEFLORE	0.21	236	2500	MRVA	MS-GW-39498	YMD
HARRIS FAMILY LTD PARTNERSHIP	SHARKEY	0.21	240	2500	MRVA	MS-GW-45350	YMD

SURFACE WATER SECTION

OWNER NAME	COUNTY	VOLUME (MGD)	VOLUME (AF/YR)	STORAGE (AF)	RATE (GPM)	SOURCE	PERMIT NUMBER	AGENCY
Surface Water Applications								
STEELE LAND TRUST 2010	WASHINGTON	0.76	855		3000	MAIN CANAL OF GRANICUS BAYOU	MS-SW-04011	YMD
HANEY FARMING	SUNFLOWER	0.21	234		3000	TAILWATER RECOVERY	MS-SW-04012	YMD
HANEY FARMING	SUNFLOWER	0.21	234		3000	TAILWATER RECOVERY	MS-SW-04013	YMD
JONES, KEITH	NOXUBEE			28		TRIBUTARY OF MACEDONIA CREEK	MS-SW-10266	DEQ
MITCHELL, REED	LEE	0.27	300		1250	SILVER BRANCH	MS-SW-10268	DEQ
COGGIN, TOMMY	MONROE	0.38	425		1700	TALLABINNELA CREEK	MS-SW-10269	DEQ
Surface Water Renewals								
MCCAUGHAN, MARIE	COAHOMA	0.11	128		1200	BIG SUNFLOWER RIVER	MS-SW-00844	YMD
YOUNG JR, W E	COAHOMA	0.09	96		3000	HARRIS BAYOU	MS-SW-00756	YMD

WIGGINS, ROBERTA S	BOLIVAR	0.29	330		2700	BIG SUNFLOWER RIVER	MS-SW-01048	Y
WIGGINS, ROBERTA S	BOLIVAR	0.20	225		3200	BIG SUNFLOWER RIVER	MS-SW-01900	Y
DUNN FARMS	LEFLORE	0.07	81		1100	ROEBUCK LAKE	MS-SW-02302	Y
DUNN FARMS	LEFLORE	0.08	94		1100	ROEBUCK LAKE	MS-SW-02303	Y
DUNN FARMS	LEFLORE	0.07	75		1100	ROEBUCK LAKE	MS-SW-02304	Y
FREEMAN, ERWYN	YAZOO			519		TRIBUTARY OF BIG BLACK RIVER	MS-SW-02932	D

DAM SAFETY SECTION

OWNER NAME	COUNTY	TYPE	APP NUMBER	SW PERMIT NUMBER	INVENTORY NUMBER	SOURCE	HAZARD CLASS
JONES, KEITH	NOXUBEE	NEW	13-024	MS-SW-10266	N/A	TRIBUTARY OF MACEDONIA CREEK	LOW

OTHER BUSINESS

The Permit Board held a hearing on a Motion for Continuance of the Evidentiary Hearing scheduled for January 14, 2014, in the MacLand Disposal Inc. II matter. Roy Furrh advised the Board that Ms. Deanna Saltzman, a Special Assistant Attorney General from the Mississippi Attorney General's office would sit with the Permit Board during the Motion hearing and serve solely as the Hearing Officer.

Ms. Gayla Crowley requested an evidentiary hearing regarding the issuance of certificate of coverage #R1-109 under the statewide general permit to MacLand Disposal, Inc. II, for its Class I Rubbish Site located in Jackson County, Mississippi. The evidentiary hearing was scheduled for January 14, 2014. Ms. Crowley requested a continuance of the evidentiary hearing to a later date. MacLand opposed the motion.

Mr. James McCafferty appeared as attorney for Ms. Gayla Crowley to request a continuance of the evidentiary hearing scheduled for January 14th, 2014. Betty Ruth Fox and Keith Turner appeared as attorneys for MacLand II and opposed the continuance request. Lisa Ouzts and Roy Furrh appeared on behalf of MDEQ and did not oppose the continuance request.

Roy Furrh stated that the Department asked the Jackson County Planning Commission to make certain that the local requirements related to the facility had been fulfilled. Jackson County wrote a letter in January 2013 indicating that the facility was in fact in compliance with local zoning requirements. Mr. Furrh stated that there is an ongoing investigation by the Jackson County Board of Supervisors related to the height restriction issue. Mr. Furrh stated that the department has requested that MacLand provide a survey to indicate compliance with the height restriction. Betty Ruth Fox and Mr. Turner assured the Board that the survey will be complete before the January 14, 2014, Permit Board meeting.

Jim Lipe moved to grant the continuance and to proceed with the hearing at the regularly scheduled Permit Board meeting in April, 2014. Jan Boyd seconded the motion. Michael B.E. Bograd opposed the motion. The Permit Board voted to grant the motion for continuance.

Confirmation of next meeting was announced by Mr. Dennis Riecke as being January 14, 2014.

MEETING ADJOURNED

There being no further business to come before the Permit Board and on motion by Jim Lipe and seconded by David Snodgrass, the meeting stood adjourned.

DATED at Jackson, Mississippi, this the 10th day of December, 2013.

TRUDY D. FISHER
EXECUTIVE DIRECTOR

COPY

STATE OF MISSISSIPPI
PHIL BRYANT
GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TRUDY D. FISHER, EXECUTIVE DIRECTOR

December 16, 2013

Ms. Heather M. Ceron, Chief
Air Permits Section
U.S. EPA, Region 4
Atlanta Federal Center
61 Forsyth Street SW
Atlanta, Georgia 30303-3104

Re: Mississippi Silicon LLC
Tishomingo County, Air Ref. No. 2640-00060
Response to Comments on the Issuance of PSD Construction Permit

Dear Ms. Ceron:

Thank you for submitting timely comments on MDEQ's PSD Permit to Construct for the project referenced above. I have reviewed the comments and made changes to both the PSD Construction Permit and the Final Determination document, which incorporates the Preliminary Determination, as a result of your comments. Please find enclosed Mississippi's Silicon's response to your comments, which they have labeled Attachment A and Attachment B. Attachment A is Mississippi Silicon's Response to the comments raised on the PSD Construction Permit and BACT analyses. Attachment B is Mississippi Silicon's response to the comments raised on the Air Quality Analysis. Mississippi Silicon has provided a thorough response to these comments and in an effort to not misconstrue this information, the MDEQ is including the response comments as an attachment to this letter which we feel you will find acceptable.

At this time the MDEQ would like to bring to your attention the changes that we have either incorporated in the PSD Construction Permit or were the responsibility of the MDEQ to address during the public notice process specifically. Those changes are those which were noted in your comment letter dated November 14, 2013 and were Comments 3, 6, and 7.

> *Comment 3 is in reference to the Opacity exiting the control device and subsequently the roof vents of the facility since the NSPS for EAFs (i.e., NSPS Subpart AAa has a 3% exiting control devices and 6% roof vents versus the NSPS Subpart Z-Ferroalloy Production which is 15%) is more stringent and can be met should be achievable in this case.*
>
> *Response 3 is that the facility and MDEQ is in agreement and a change to the PSD Construction Permit has been made whereby the Opacity exiting the control device for*

64456 PER20130001

EXHIBIT
"3"

the SAFs is 3%, roof vents from the silicon production is 6%, and facility wide (including dust handling) is 10%.

Comment 6 is in reference to Startup, Shutdown, and Malfunction Emissions from the Facility and the request that the permit state that SSM emissions be included in evaluating compliance.

Response 6 is that Startup and Shutdown emissions have already been accounted for in the individual emission limitation for the facility including the BACT emission limitations. The Continuous Emissions Monitoring System (CEM) and Performance Testing will validate the potential emissions when these events occur also. Malfunction emissions, however are those emissions that wouldn't normally occur because of unforeseen instances and are not part of any routine method of operation and are defined by Mississippi Code. These things have been accounted for in the Permit.

Comment 7 is in reference to consultation with other states due to the potential to impact the air quality of Tennessee and Alabama.

Response to Comment 7 is that Mississippi does public notice the affected states in the same manner as the general public and has verified that this was done in a timely manner and carried out accordingly.

Should you have any additional questions or need further information, please feel free to contact me at (601) 961-5784. Again, we appreciate your comments and timeliness.

Sincerely,

Bonnie Morgan

Bonnie Morgan
Metal and Metal Fabricators Branch
Environmental Permits Division

Enclosures (2)

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Attachment A
Proposed Mississippi Silicon LLC Project
Tishomingo County, MS
Follow-Up Response –Comments Raised by EPA Region IV
November 22, 2013

Provided below are responses to comments raised by the EPA Region IV as it pertains to the Mississippi Silicon LLC Project to be located in Tishomingo County, Mississippi. For ease of review we have provided the EPA Region IV comment followed by an appropriate response.

Question #1 - Best Available Control Technology (BACT) for GHGs: Reducing energy consumption will reduce greenhouse gas emissions. The identification of available control technologies (page 4-8) identifies post combustion of the flue gases and states this is not available for silicon metal. It is not clear how this conclusion was reached. We believe that post combustion of the flue gases is both available and technically infeasible for this facility. There appears to be ample waste heat and CO available that could be used to pre-heat the ladle or the incoming charge. Alternatively, if direct use of the waste energy is impractical, the flue gas could be used to generate electricity. Further, we note that other facilities with EAFs have successfully installed off-gas waste heat recovery systems. The flue gas characteristics of the MS Silicon facility have not been demonstrated to be so different from many similar operations (e.g., steel mills and smelting operations) to simply rely on the claim that it has not been proven in silicon plants to dismiss it as technically infeasible. In addition, the permit application includes a reference to energy recovery as being part of a typical Silicon Manufacturing facility. (See Figure 2-2b, General Process Diagram - Typical Silicon Manufacturing Process, includes energy recovery in the diagram with a footnote that the energy recovery was not considered for the proposed facility). Thus, it appears that this measure should be considered technically feasible and alternative energy recovery options should be further evaluated for economic feasibility under the BACT analysis.

RESPONSE #1:

While recovery from clean gaseous streams in the steel industry is common, heavily contaminated exhaust gases from coke ovens, blast furnaces, basic oxygen furnaces, and electric arc furnaces continue to present a challenge for economic waste heat recovery. Heat recovery techniques from these dirty gaseous streams are available, yet implementation has been limited due to high capital investment costs[1].

Capturing and reusing the heat generated from the Submerged Arc Furnaces (SAF) for the ladle operation is considered technically and economically infeasible for the following reasons:

- Several physical limitations (space / distance) from the SAF to the ladles will not allow heat to be captured from the SAF and then transferred to the location of the ladle operations.
- The ladle operation also involves a mechanical crane which restricts any additional equipment in and around the ladle areas.

[1] Waste Heat Recovery: Technology and Opportunities in U.S. Industry, BCS Incorporated, March 2008

- The heat input of the ladle preheaters is 10 MMBtu/hour each thus the small amount of natural gas combusted does not justify the capital costs of a heat recovery system.

Some of the other common approaches to waste heat recovery from exhaust gases include:

- Combustion air preheating - Not applicable at Mississippi Silicon (used only as building utilities)
- Load or charge preheating - This has been applied to drying and preheating of ores; however, quartz is not amenable to preheating and heat retention. Drying of the carbon sources is not recommended due to potential combustion or explosion hazards.

In general, key restrictions preventing heat recovery in a particular application can include cost, temperature restrictions, chemical composition of heat streams, application specific constraints, and difficulty accessing and transporting non-fluid heat sources. Challenges for heat recovery under these constraints include material costs, maintenance costs, lack of a local end use for low temperature heat, environmental concerns, and the need for process and product quality control[2].

Regarding the use of the flue gas to generate electricity by utilizing the chemical energy in the off-gas the following limitations are noted. While technically feasible, installation and operation of either a turbine/generator system to produce electricity or a boiler system for steam production is cost excessive in light of the current electricity costs available to MS Silicon in Mississippi.

A number of factors in addition to the temperature of the waste heat must be considered to determine the economic feasibility of power generation from waste heat sources[3]. The total cost to install a waste heat system includes the costs associated with the waste heat recovery equipment (boiler or evaporator), the power generation equipment, power conditioning and interconnection equipment. It would also include the soft costs associated with designing, permitting and constructing the system.

A first-cut estimate of the cost of producing power from this type of system is presented in Table 1. Representative costs are shown that represent a range of project sizes (<400 kW to > 5 MW) and site complexity. Capital costs are amortized over a 10 year period based on a cost of capital of 15 percent and 7,500 annual operating hours. Operation and maintenance (O&M) cost estimates can also vary widely.

Table 1 - Waste Heat to Power (WHP) Cost Comparison[3]

Cost Component	
Installed Costs, $/kW	$2,000 - $4,000
WHP Generating Costs	
Amortized Capital, $/kWh	$0.055 - $0.125
O&M Costs, $/kWh	$0.005 - $0.020
Total Power Cost, $/kWh	**$0.060 - $0.125**

Source: *ICF International estimates, 2012*

[2] Waste Heat Recovery: Technology and Opportunities in U.S. Industry, BCS Incorporated, March 2008

[3] EPA (U.S. Environmental Protection Agency). 2007b. EPA Combined Heat and Power Partnership (CHPP). Catalog of CHP Technologies. Available at http://www.epa.gov/chp/basic/catalog.html.

Based on the above information, power costs for a WHP system range from $0.060 to 0.125 per kWh. MS Silicon has a power supply contract that will provide electricity at a delivered cost below the low end of the range of $0.06/kWh, thus this difference in electricity costs is considered cost excessive for this project.

MS Silicon will continually review waste heat recovery systems and as newer technologies emerge, will evaluate their economic and technical feasibility. The plant will be designed with physical space for future waste heat recovery opportunities.

Question #2 - BACT for Particulate Matter - Opacity: EPA previously noted that that the application contains insufficient explanation of the opacity limits for the facility as a whole and on the baghouse on the submerged EAF. EPA suggested consideration of opacity limits for particulates that exit from a control device of 3 percent opacity or less, and particulates that exit from the plant, due solely to the operations of any affected EAF, of 6 percent opacity or less and a prohibition on from the dust handling system of any gases of 10 percent opacity or less. In their response to our comments, the applicant agreed that these limits are acceptable. However, the new opacity limits do not appear to be in the preliminary determination's BACT analysis (section III) or the summary of permit limitations (section V). We continue to believe these recommended limits are appropriate and should be included in the permit.

RESPONSE #2 – MS Silicon believes that these limits are acceptable and should be included in the permit.

Question #3 - BACT for SO_2: We believe that a more robust analysis of BACT alternatives is necessary to support the permit record. If built as proposed (4 units), the facility is projected to emit over 2,000 tons of SO_2 and the air quality modeling indicates that the facility will violate the NAAQS for SO_2. Incorporating temporary limits in the PSD permit that restricts operation to two of four proposed submerged EAFs is not an acceptable alternative to identifying the appropriate SO_2 control technology and requiring its operation in the PSD permit. In addition, the analysis does not make it clear why variable emission rates result in technologies such as Spray Dry Adsorption and Dry Sorbent Injection technically infeasible. We would expect that these technologies are technically feasible since limestone is already used in the process as a flux and sorbent flow rates can be adjusted as emission rates change. There are other industrial processes with variable emission rates that control SO_2. In addition, there are a host of sulfur removal options besides those identified in the preliminary determination, as well as viable fuel based alternatives such as low sulfur coal or greater reliance on wood, that are not affected by the variability of the emission rate. In short, there are technically feasible options for the control of SO_2 that we recommend be considered in the BACT analysis.

RESPONSE #3 -

The volumetric exhaust gas flow rate from one SAF baghouse is approximately 81,500 scf/minute. When coupled with the relatively low SO_2 emission rates, a relatively small SO_2 concentration is in the exhaust. - Based on engineering estimates, the concentration of SO_2 in the offgas is about 90 ppm. This is much

lower than the concentration typically found for flue gas desulfurization systems such as wet and dry scrubbers[4]. The SO_2 concentration will also vary widely over the SAFs cycle.

The Spray Dry Adsorption (SDA) control alternative has the following significant limitations for effective technical applicability for SAF applications:

(i) The low SO_2 concentration in the influent coupled with a relatively large gas flow would retard the adequate contact interface with the reagent;

(ii) The variations in the SO_2 concentration during and between heats would severely impair the control system's capability to respond adequately. SDA systems are not designed for adept load-follow flexibility; and

(iii) The low temperature of the exhaust gas of around 350 °F and the low gas moisture would not allow sufficient thermal gradient for an appropriate approach to saturation which typically specifies that the temperature of the desulfurized gas stream leaving the spray dryer be around 30 – 50 °F above its dew point;

Thus, SDA dry scrubbing option is considered technically infeasible for this application.

The Dry Sorbent Injection (DSI) control option typically involves the injection of dry powders into either the furnace or post-furnace region of utility-sized boilers. This process was developed as a lower cost option to conventional FGD technology. Since the sorbent is injected directly into the exhaust gas stream, the mixing offered by the dry scrubber tower is not realized. The maximum efficiency realized for this SO_2 control technology is estimated to be fairly nominal. It is felt that if sufficient amounts of reactants are introduced into the flue gas, there is a possibility of some degree of mixing and reaction. The science is inexact and the coupling of reactant dosage and in-flue mixing which impacts the SO_2 control efficiency is susceptible to variability in SO_2 concentrations.

This control alternative has the following significant limitations for effective technical applicability for SAF application:

(i) The low SO_2 concentration in the influent coupled with a relatively large gas flow would retard the adequate contact interface with the reagent;

(ii) The variations in the SO_2 concentration during and between heats would severely impair the control system's capability to respond adequately. DSI systems are not designed for adept load-follow flexibility and variable reactant dose control with fast response times comparable to anticipated process conditions; and

(iii) Due to the anomalies of mixing afforded by the process, the reaction kinetics are not very flexible and rather time-dependent. Unlike the SDA system, the mixing uncertainty can potentially reduce DSI technology to a sheer brute-force proposition resulting in unstable and unpredictable performance;

[4] Air Pollution Control Technology Fact Sheet, EPA-452/F-03-034

Question # 5 - Startup, Shutdown and Malfunction (SSM) emissions: There is no discussion on how SSM emissions are to be treated from this facility. We recommend that the permit state that SSM emissions are to be included in evaluating compliance.

RESPONSE #5 –MS Silicon does not foresee any significant changes in emissions of regulated air pollutants during startup and shutdown events of the proposed submerged arc furnace. MS Silicon will develop, prior to operation of the submerged arc furnaces, startup, shutdown and malfunction operation plans to ensure excess emissions do not occur during these events. The draft permit requires the installation and operation of continuous emission monitors for NOx, CO and SO_2 and thus will be able to demonstrate compliance with the emission limitations established by the MDEQ as well as those emissions that would occur during startup and shutdown events. MS Silicon will take appropriate actions to minimize excessive emissions during malfunction events.

Attachment B
Proposed Mississippi Silicon LLC Project
Tishomingo County, MS
Follow-Up Response –Comments Raised by EPA Region IV – Air Quality Impact Evaluation
November 22, 2013

Provided below are responses to comments raised by the EPA Region IV as it pertains to the Mississippi Silicon LLC Project to be located in Tishomingo County, Mississippi. The comments raised by EPA Region IV pertained to the air quality impact evaluation that was performed in support of the PSD air permitting process.

For ease of review, we have provided the EPA Region IV comment followed by an appropriate response.

Question #1 – Significant Impact Area – Contradictory modeling information that affects the impact assessments has not been resolved (e.g., significant impact areas are indicated to be contained within Tishomingo County while MDEQ's Preliminary Determination indicates otherwise).

Response #1:

The Significant Impact Areas (SIA) for each regulated air pollutant subject to PSD review for the MS Silicon plant project was provided in Table 2-4. Refer to Table 2-4 attached to this attachment that defines the SIA for each regulated air pollutant and corresponding averaging period. The extent of the SIA was based on the proposed operation of four (4) SAF units associated with the proposed plant. Based on operation of the four (4) SAF units, the SIA was shown not to extend into Tennessee or Alabama for PM_{10}. The SIA for $PM_{2.5}$ was also shown to not impact Tennessee and Alabama. The SIA areas for the SO_2 3-hour, 24-hour and annual averaging periods were also shown not to extend into Tennessee and Alabama. The NO_2 annual averaging period did not extend into Tennessee or Alabama. The initial SIA's for SO_2 and NO_2 1-hour averaging periods were predicted to extend into Tennessee and Alabama based on operation of four (4) SAF Units. Operation of two (2) SAF units did reduce the overall extent of these SIA's, however the area still extends into portions of Tennessee and Alabama. Refer to Figures 3-5a and 3-6a that provide a visual representation of the areas affected in Tennessee and Alabama. Since the figures do not identify the overall extent of the SIA, refer to Figures 3-5f and 3-6c which identifies the receptor placement with the significant impact areas.

Question #2 – SO2 Impacts Sipsey Wilderness Area: The project impacts to the Sipsey Wilderness PSD Class I area are greater than the SO_2 SIL. These significant impacts generally indicate the need to perform a cumulative PSD Class I area increment assessment or a sufficient demonstration why the cumulative PSD Class I area increment assessment is not needed. This should be reconciled in the permit record before a permit is issued.

Response #2 – Included as an attachment is a copy of the executive summary from the technical report provided to the MDEQ and the Federal Land Manager. As shown in this document, the only item of discussion is that the proposed plant will have predicted impacts of SO_2 emissions that will be above the significant impact levels for the 3-hour and 24-hour averaging period. However, the predicted concentrations are slightly above the SILs. The predicted concentrations from the proposed plant are shown to be 1.0 ug/m^3 for the Class I 3-hour increment which is only 4% of the Class I increment of 25 ug/m^3. Predicted concentrations for the 24-hour period were 0.2 ug/m^3 which also only represents 4% of

the Class I increment of 5 ug/m^3. ***MS Silicon is not aware of any other SO_2 sources in the area (considered to be Class I increment consuming) that when combined with the potential impacts from the MS Silicon plant would cause an exceedance of the Class I increments at Sipsey Wilderness Area.***

It is important to note that EPA Region IV did make a request that the chemical transformation algorithm should be turned off in Calpuff and the model reran. The model was reran and the results obtained did not alter the discussion / nor the conclusion discussed above. A copy of that updated analysis is also attached.

Since the percentage of the Class I increment to be consumed at the Sipsey Wilderness Area is extremely low (<4%) based on potential emissions from the MS Silicon plant, inclusions of other potential SO_2 existing sources (that would consume increment) in the Class I analysis would not drastically affect or alter the outcome of that analysis. The probability of other existing increment consuming sources having predicted Class I increment concentrations at or above 96% of the Class I SIL would be extremely low. MS Silicon did request a listing of other SO_2 increment consuming sources that should be included in the Class I analysis. All three agencies; MDEQ, Federal Land Manager and EPA Region IV were not aware of any other SO_2 increment consuming sources that should be included in that analysis. Consequently, MS Silicon has concluded that the Class I analysis is complete and that no further evaluation is required. The Federal Land Manager has also formally accepted the analysis with no stipulations for further evaluations to be conducted.

Question #3 – NAAQS Compliance Modeling does not provide sufficient information and analyses – The PSD Class II area National Ambient Air Quality Standards (NAAQS) compliance modeling and documentation does not provide sufficient information and analyses to support the statement that the project will not cause or contribute to the modeled NAAQS exceedance.

Response #3 – MS Silicon has provided an air quality impact evaluation discussion in the initial PSD air permit application dated August 15, 2013 and Addendum #1 document dated October 10, 2013. As presented in those documents, air quality impacts resulting from the proposed MS Silicon plant project were shown to be below the NAAQS for each regulated air pollutant subject to PSD review. After initial review by EPA Region IV and MDEQ, further analysis was requested to ensure that the proposed MS Silicon plant project would not contribute to predicted exceedance of the SO_2 and NO_2 1-hour NAAQS. EPA Region IV also requested clarification of some of the supporting information that was used to support the modeling analysis. Two separate letters were sent to the MDEQ answering specific questions raised by MDEQ and EPA Region IV and were dated October 2nd an 23rd, respectively. At the request of the MDEQ, MS Silicon was asked to assemble all of the information presented in the initial application, Addendum #1 and two follow-up letters. MDEQ also requested that additional modeling be performed to further support that the MS Silicon plant project would not cause or contribute to a predicted exceedance of the NAAQS. To satisfy MDEQ's request, a stand alone document was prepared, herein referred to as Addendum #2 which was provided to the MDEQ via email on November 22, 2013.

The intent of Addendum #2 is to provide one overall document that contains the analysis contained in: a) the PSD application, b) the additional analysis provided in Addendum #1, and c) to consolidate the responses provided in the two response letters noted above. This document provides the entire air quality impact evaluation as it pertains to the air quality impact requirement for regulated air pollutants subject to PSD review. Also included in this document is an analysis that demonstrates that emissions of

VOC and NO_x from the proposed plant will not significantly impact or alter the ozone concentration levels currently existing in the area of the proposed plant site as measured by ambient monitoring conducted by the MDEQ.

As demonstrated in that document, the proposed MS Silicon plant will result in predicted ambient air quality impacts that meet the PSD Class II increments, as well as the NAAQS for each air pollutant subject to PSD review. The following approach was utilized as summarized below:

- ***Step 1*** – Potential emissions from each source of air pollution from the proposed plant were modeled using an EPA approved air dispersion model. This included emissions of PM_{10}, $PM_{2.5}$, NO_x, SO_2, CO and VOCs (i.e., ozone conversion only) which were subject to PSD review. Emissions from the plant were reflective of four (4) submerged arc furnaces (SAFs) operating simultaneously. MS Silicon is proposing to construct the plant in two phases, with two SAFs being associated with each phase. The predicted concentrations from modeling all four SAFs meet the Class II increments and NAAQS for each regulated air pollutant listed above.

- ***Step 2*** – Using the predicted concentrations obtained from Step 1, the plant's area of significant impact was defined using the significant impact level (SIL) concentration thresholds. The purpose of defining the area of significant impact is to define what existing air emission sources should also be evaluated in conjunction with the proposed MS Silicon emission sources. This is referred to as the multi-source impact analysis and is used to demonstrate that the MS Silicon plant's proposed emission sources will not cause or contribute to an exceedance of the NAAQS.

During this step, it was determined that several existing sources were shown to have predicted concentrations that exceeded the SO_2 and NO_2 1-hour NAAQS. Because of these predicted exceedances, several additional modeling analyses were performed to demonstrate that the proposed plant's air emission sources would not contribute to a predicted exceedance of those 1-hour NAAQS. This analysis was required to demonstrate that the plant's air emission sources would result in predicted concentrations on those predicted exceedance receptors below the significant impact levels established for SO_2 and NO_2 1-hour concentrations. In order to demonstrate that the proposed MS Silicon plant's air emissions would not exceed the significant impact levels on those receptors predicted to exceed the 1-hour NAAQS, MS Silicon restricted the operation of the four (4) SAFs to no more than two (2) SAFs operating simultaneously.

The air quality impact evaluation performed during Step 1 and Step 2 was reflective of four (4) SAF units operating simultaneously. Because the predicted concentrations (i.e., PM_{10}, $PM_{2.5}$, CO) were shown to be in compliance with the PSD Class II increment and NAAQS, the evaluation was not redone to reflect operation of two (2) SAF units. This is conservative and reflects a worst case modeled predicted concentration. The PSD Class II increment for SO_2 and NO_2 were also based on operation of four (4) SAF units. Thus, the only modeling analysis that was reflective of operation of two (SAF) units was the SO_2 and NO_2 1-hour NAAQS. There are no Class II increments associated with SO_2 and NO_2 for a 1-hour averaging period.

As discussed in the initial PSD air permit application, the proposed MS Silicon plant project triggered PSD review for emissions of PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2 and VOCs. It is therefore necessary to demonstrate that the potential emissions of these regulated air pollutants will not: 1) result in predicted air quality impacts that would be harmful to human health and welfare (referred to as the NAAQS compliance

demonstration), and 2) will not result in predicted concentrations that would limit industrial growth in the area (referred to as the PSD Class II increment analysis). Information provided in Addendum #2 provides technical information to support that the proposed emission sources from the MS Silicon plant project will meet the two PSD review requirements noted above.

An ozone air quality impact analysis is also required under PSD review if VOC or NO_x emissions from the proposed plant are more than 100 tons/year. Since NO_x emissions (emissions of VOC were slightly below 100 tons/year) from the proposed plant will be above 100 tons/year, an air quality impact evaluation was performed to demonstrate that the combined emissions of VOC and NO_x would not cause or contribute to a violation of the ozone NAAQS. The analysis performed and the results obtained from that analysis are provided in Section 4.5 of Addendum #2. As shown in that section, the proposed project will have an insignificant impact on ozone air quality and will not cause or contribute to an exceedance of the ozone NAAQS.

Section 4.5 of Addendum #2 provides the analysis performed, including the results obtained from that analysis to demonstrate the proposed plant's emissions of regulated air pollutants will not adversely impact local soils and vegetation. A Class I impact analysis was also performed which demonstrated that the proposed plant's emissions of regulated air pollutant would: a) not affect visibility, b) not exceed Class I increment standards, and c) will not cause deposition at the Sipsey Wilderness Area located in Alabama. The analysis performed and results from that analysis were submitted to the MDEQ and the Federal Land Manager under separate cover. The Federal Land Manager has approved the analysis that was performed and has concluded that the proposed MS Silicon plant will not adversely impact the Sipsey Wilderness Area. As a point of note, the analysis performed was reflective of operation of two (2) SAFs.

Provided below is a summary of the predicted concentrations obtained from the multisource air quality impact evaluation. These predicted concentrations were obtained following EPA modeling procedures and reflect worst case impacts based on operation of two (2) SAF units associated with the proposed plant project. Detailed modeling was performed, including multiple analyses to demonstrate that the proposed plant (based on operation of two (2) SAF units) will not cause or contribute to a predicted exceedance of the NAAQS. Refer to Addendum #2 for supporting technical information and modeled results.

- **Maximum Predicted Concentrations from PM_{10} NAAQS Analysis**

  As shown in Table 3-5 of Addendum #2, predicted PM_{10} concentrations are below the PM_{10} 24-hour NAAQS. The maximum predicted concentration listed below meets the PM_{10} NAAQS:

  - PM_{10}– 24-Hour – 66.48 ug/m^3 compared to the NAAQS of 150 ug/m^3.

- **Maximum Predicted Concentrations from $PM_{2.5}$ NAAQS Analysis**

  As shown in Table 3-5 of Addendum #2, predicted $PM_{2.5}$ concentrations are below the $PM_{2.5}$ 24-hour NAAQS. The maximum predicted concentration listed below meets the $PM_{2.5}$ NAAQS:

  - $PM_{2.5}$ – 24-Hour – 25.13 ug/m^3 compared to the NAAQS of 35 ug/m^3; and
  - $PM_{2.5}$ – Annual – 11.68 ug/m^3 compared to the NAAQS of 12 ug/m^3.

- **Maximum Predicted Concentrations from SO_2 NAAQS Analysis**

  As shown in Table 3-6b Addendum #2 predicted SO_2 concentrations are below the SO_2 NAAQS. The maximum predicted concentration listed below meets the SO_2 NAAQS:

  - SO_2 – 1-Hour – 137.99 ug/m^3 compared to the NAAQS of 196 ug/m^3;
  - SO_2 – 3-Hour – 115.38 ug/m^3 compared to the NAAQS of 1,300 ug/m^3;
  - SO_2 – 24-Hour – 34.94 ug/m^3 compared to the NAAQS of 1365 ug/m^3; and
  - SO_2 – Annual – 8.36 ug/m^3 compared to the NAAQS of 80 ug/m^3.

- **Maximum Predicted Concentrations from NO_2 NAAQS Analysis**

  As shown in Table 3-7d and Table 3-8 in Addendum #2 predicted NO_x concentrations are below the NO_x annual and 1-hour NAAQS, respectively. The maximum predicted concentration listed below meets the NO_2 NAAQS:

  - NO_2 – Annual – 10.90 ug/m^3 compared to NAAQS of 100 ug/m^3; and
  - NO_2 – 1-Hour – 163.6 ug/m^3 compared to NAAQS of 188 ug/m^3.

It should also be noted that multiple model runs were made to demonstrate that the proposed MS Silicon plant project (operation of two (2) SAF units) would result in predicted concentrations that would be below the Class II Significant Impact Level on each occurrence of a predicted exceedance of the NO_2 1-hour NAAQS. The Maxcount option of AERMOD was also utilized to demonstrate the insignificant impact concentrations from the proposed plant on predicted exceedances of the 1-hour NO_2 NAAQS.

Question #4 – PSD Class II Compliance Modeling does not provide sufficient information and analyses – The PSD Class II area PSD increment compliance modeling and documentation also does not provide sufficient information and analyses to support the statement that the project will not cause or contribute to a PSD increment exceedance.

Response #4 – MS Silicon has provided an air quality impact evaluation discussion in the initial PSD air permit application dated August 15, 2013 and Addendum #1 document dated October 10, 2013. As presented in those documents, air quality impacts resulting from the proposed MS Silicon plant project were shown to be below the PSD Class II increments for each regulated air pollutant subject to PSD review. After initial review by EPA Region IV and MDEQ, further analysis was requested to ensure that the proposed MS Silicon plant project would not contribute to predicted exceedance of the Class II increments.

At the request of the MDEQ, MS Silicon was asked to assemble all of the information presented in the initial application, Addendum #1 and two follow-up letters. To satisfy MDEQ request, a stand alone document was prepared, herein referred to as Addendum #2 which was provided to the MDEQ via email on November 22, 2013. As presented in that document the following information was provided on the PSD Class Increment analysis:

According to MDEQ modeling guidance, Tishomingo County's minor source baseline date has not been triggered for regulated air pollutants with established Class II increments. Since this is the first PSD permit in the county to result in predicted concentrations above the PSD significant impact levels for SO_2, NO_2, PM_{10} and $PM_{2.5}$, the PSD minor source baseline date will be triggered as part of this PSD permitting process.

The minor source baseline dates have already been triggered for the counties surrounding Tishomingo:

- Alcorn County – **NO_x** – 01/26/2005, **PM_{10}** – 01/26/2005, **SO_2** – 01/26/2005
- Prentiss County – **NO_x** – 10/22/2007 and **PM_{10}** – 10/22/2007.

The PSD Class II increments currently established by U.S. EPA are as follows:

- PM_{10} – 30 ug/m^3 24-hour averaging period and 17 ug/m^3 annual averaging period
- $PM_{2.5}$ - 9 ug/m^3 24-hour averaging period and 4 ug/m^3 annual averaging period
- NO_2 – 25 ug/m^3 annual averaging period
- SO_2 – 512 ug/m^3 3- hour averaging period, 91 ug/m^3 24-hour averaging period and 20 ug/m^3 annual averaging period.

The PM_{10}, $PM_{2.5}$, SO_2 and NO_2 PSD Class II increment compliance demonstrations did not require preparation of a multisource air modeling inventory because the MS Silicon project sources are the only PSD increment consuming source for these regulated air pollutants, being the first major source of these air pollutants to go through PSD review in the area since the increment was established. The results of the air dispersion modeling indicates that the MS Silicon plant will be in compliance with the PSD Class II increments

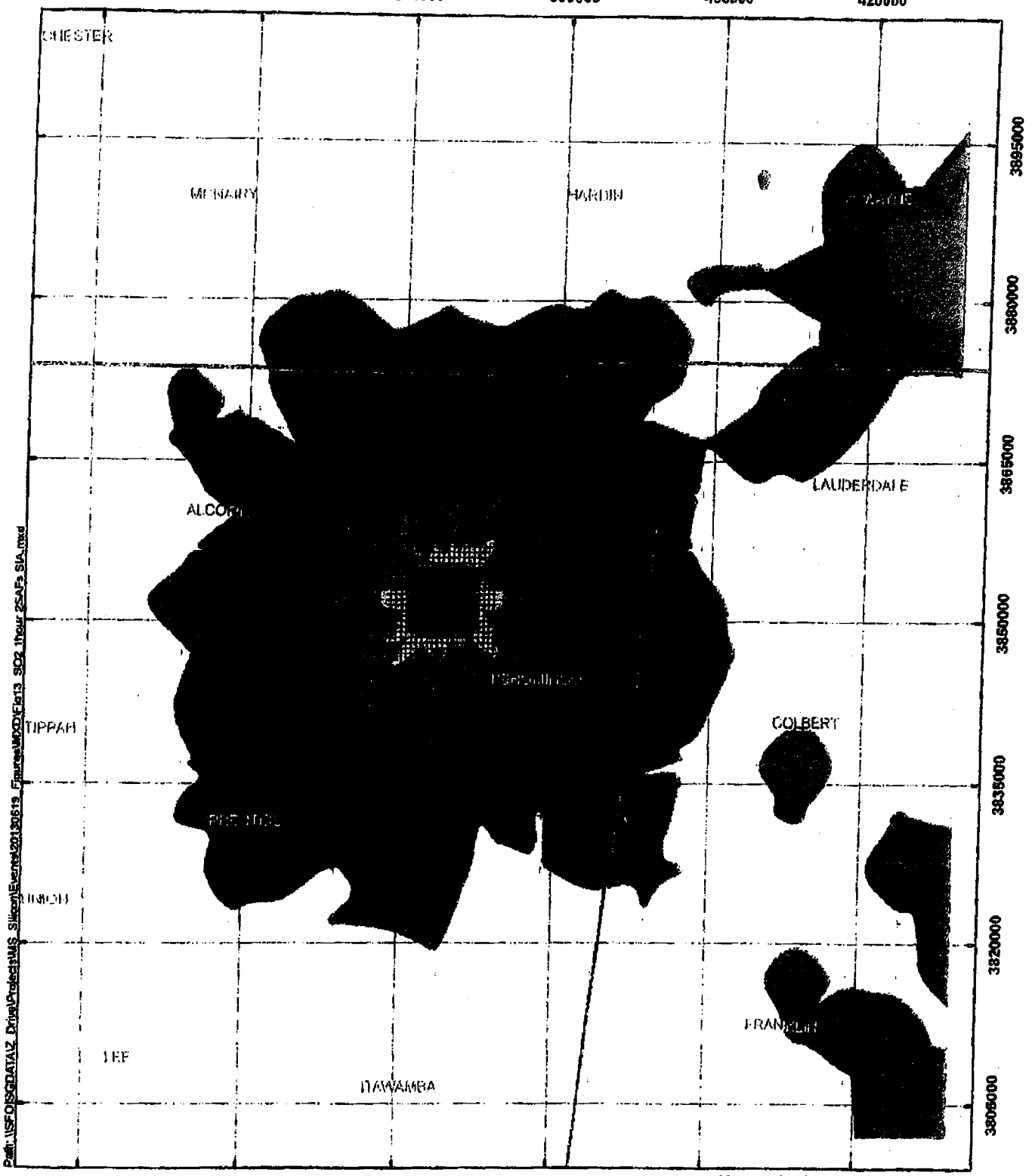
Since the significant impact areas for the proposed plant's emissions of PM_{10}, $PM_{2.5}$, NO_2 (annual averaging period) are within Tishomingo County, no impact on Class II increment consumption should occur in other counties in Mississippi, Tennessee or Alabama. The proposed project is the only identified source that will consume Class II increments. In the initial PSD Class II increment analysis for emissions of SO_2, it was determined that the SO_2 area of influence would extend into Alcorn County. Since the PSD minor source baseline date for SO_2 had already been defined, a demonstration of compliance with the SO_2 PSD Class II increment would have to include the proposed MS Silicon plant emission sources, as well as any other Class II increment consuming SO_2 existing sources. The MDEQ confirmed that the only other SO_2 Class II increment consuming source would be Kingsford Manufacturing Company located approximately 13 kilometers to the northeast of the proposed MS Silicon plant site in Alcorn County. Inclusion of this emission source in the modeling analysis, along with the MS Silicon SO_2 emission sources did not result in predicted SO_2 concentrations higher than that initially determined for the MS Silicon plant emission sources only. In short, this demonstrates that there are no interactions of the emission sources from these two plants that would cause an increase in the predicted concentration that is being used for comparison with the Class II increment standards.

The maximum PSD Class II increment consumption results are in the attached Table 2-5.

Table 2-4
MS Silicon LLC
Proposed Silicon Manufacturing Plant
Summary of Applicable Standards PSD Class II SILs Distances*

PM_{10}	24-Hour	5	4	2007	Highest first high of the 5 years
	Annual	1	2	2007	Highest of the 5 years
$PM_{2.5}$	24-Hour	1.2	7	2008	Average of the highest from each year
	Annual	0.3	2.6	2011	Average of the highest from each year
NO_2	1-Hour	7.52	50	2007	Average of the highest maximum daily 1-hour concentration from the 5-year period
	Annual	1	6	2011	Highest of the 5 years
SO_2	1-Hour	7.8	50	2007	Average of the highest maximum daily 1-hour concentration from each year
	3-Hour	25	11	2009	Highest first high of the 5 years
CO	1-Hour	2000	--	--	Average of the highest from each year
	8-Hour	500	--	--	Average of the highest from each year

Notes:
*Based on operation of four (4) SAF units



Legend

SIL Area	30.0	Risk Receptors	
7.8	50.0	Property Boundary	
12.0	60.0		
20.0	66.0		

N

0 20,000 40,000

Scale: Feet

Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

SO_2 1-hour SIL Area
2 SAFs, 5 Year Average

K/J 1341008*00
November 2013
Figure 3-5a

Path: \\SFOIS\GDATA\2_Drlsg\Projects\MS_Silicon\Events\20130619_Figures\MXD\Fig13_SO2_1hour_2SAFs_SIA.mxd

Legend

Risk Receptors

PropBoundary

N

0 15,000 30,000

Scale: Feet

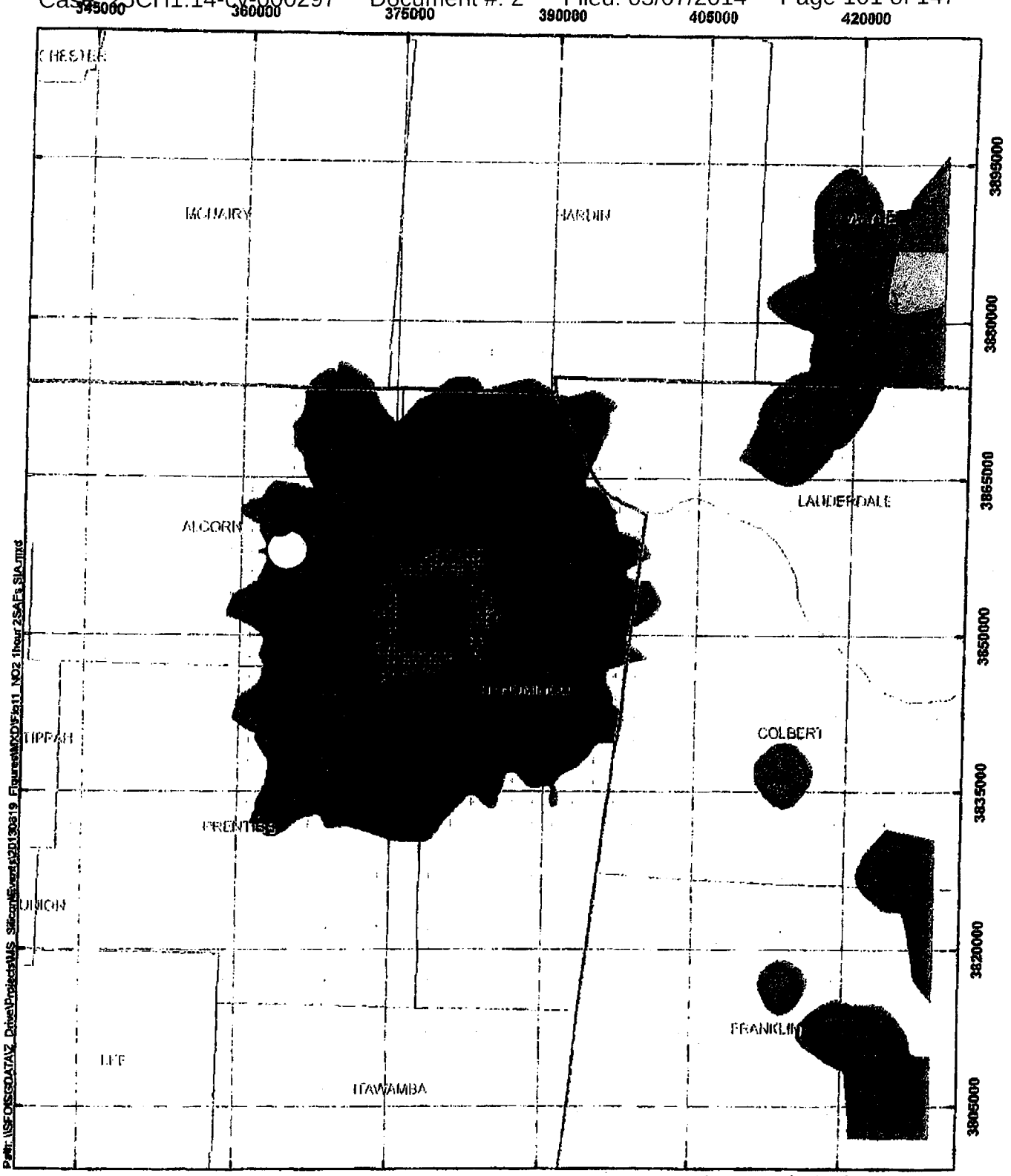
Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

SO2 1-hour Receptor Grid

K/J 1341008*00
November 2013

Figure 3-51



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Legend

SIL Area
- 7.52
- 10.0
- 20.0
- 40.0
- 50.0
- 54.9

Risk Receptors

Property Boundary

N

0 20,000 40,000

Scale: Feet

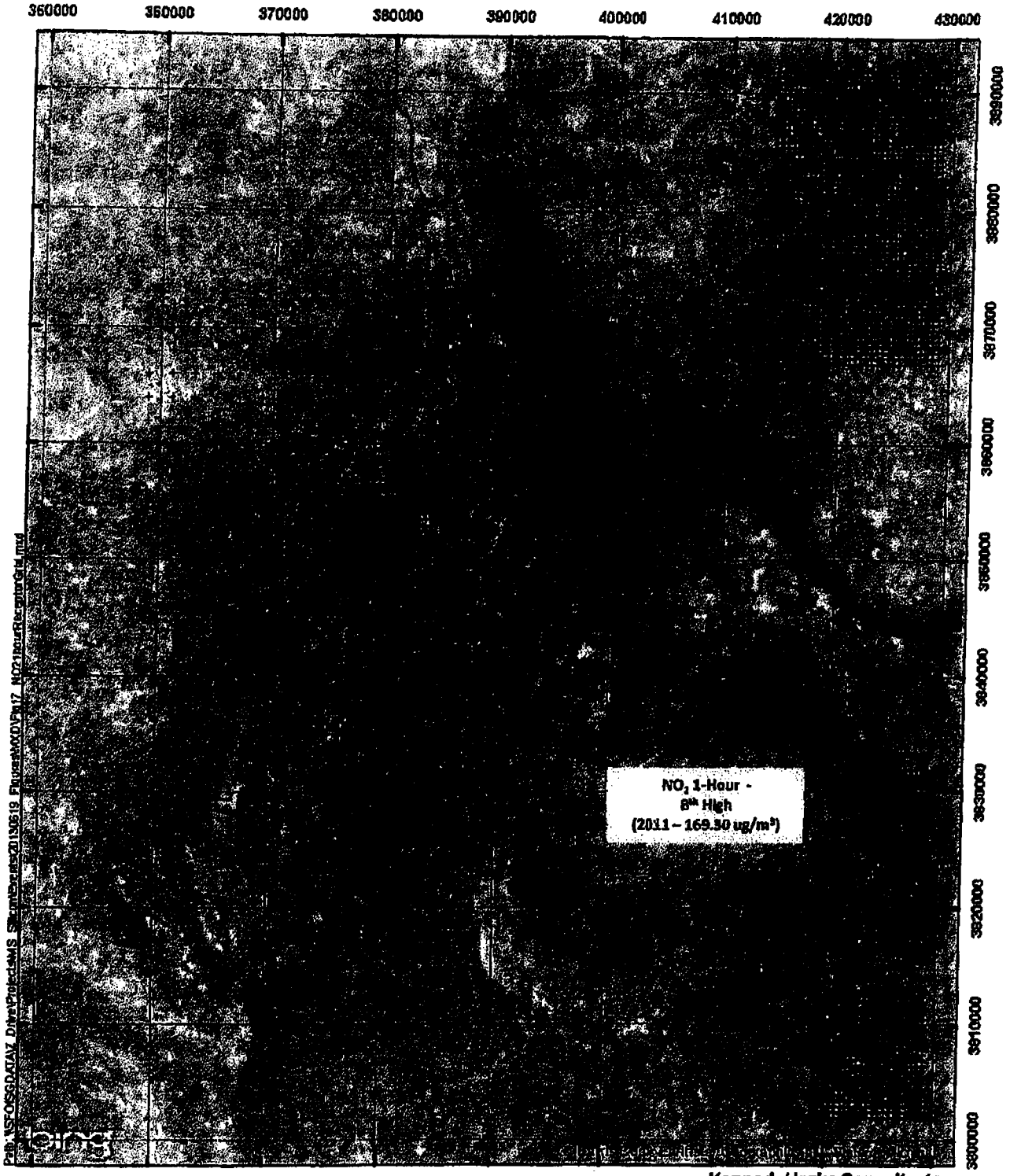
Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

NO_2 1-hour SIL Area
2 SAFs, 5 Year Average

K/J 1341008*00
November 2013

Figure 3-6a



NAAQS

● NO_2 1-Hour – 188 ug/m³ (Average of Eighth Highest)

Legend

- Risk Receptors
- Property Boundary
- Buildings

N

0 15,000 30,000

Scale: Feet

Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

NO2 1-hour Receptor Grid

K/J 1341008*00
November 2013

Figure 3-6c

Meteorological Solutions Inc

October 9, 2013

Mr. Steven Frey
Manager Air Quality
Kennedy/Jenks Consultants
1515 East Woodfield Road, Suite 360
Schaumburg, Illinois 60173

Dear Mr. Frey:

Per our conversation today, please find attached an Executive Summary describing the impacts of Mississippi Silicon emission sources on the Mingo and Sipsey Class I areas.

If you have any questions regarding this report, feel free to contact me.

Sincerely,

Scott Adamson
Meteorologist/Dispersion Modeler

\\MSI_SERVER_2012\msi_server\Msi\Projects\2013\13-68 KennedyJenks Silicon Modeling\MS Silicon Executive Summary Letter.doc

4525 Wasatch Blvd | Suite 200 | SLC, UT 84124
Phone 801-272-3000 | Fax: 801-272-3040
www.metsolution.com | info@metsolution.com

Meteorological Solutions Inc

Attachment A
PSD Class I Air Quality Analysis Executive Summary

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EXECUTIVE SUMMARY

A Prevention of Significant Deterioration (PSD) Class I ambient air quality analysis was conducted for the emission sources associated with Mississippi Silicon, LLC proposed silicon manufacturing plant to be located in Tishomingo County, near the town of Burnsville, Mississippi. The air dispersion modeling analyses were conducted to evaluate the air quality impact on two Class I areas, Sipsey and Mingo Wilderness areas, which are located within a 300 kilometer radius of the proposed plant. The air modeling analyses evaluated the potential air quality impacts on the Sipsey and Mingo Wilderness areas and included the Class I Area Increment and Air Quality Related Values (AQRVs) which evaluated the Class I Significant Impact Levels (SILs), visibility impairment, and sulfate and nitrate deposition impacts.

To perform the Class I area analyses, the CALPUFF Modeling System (CALPUFF (Version 5.8), CALMET (Version 5.8), and CALPOST (Version 6.221)) which is the long range transport model recommended by the draft Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report—Revised (2010), was utilized. CALPUFF is a non-steady state Lagrangian Gaussian puff long-range transport model that includes algorithms for building downwash effects, as well as chemical transformations (important for visibility controlling pollutants), and wet/dry deposition. CALPUFF uses the wind fields generated by CALMET to make the transport and dispersion calculations.

CALMET, the meteorological preprocessor for CALPUFF, is a diagnostic meteorological model that produces three-dimensional wind and temperature fields and two-dimensional fields of other meteorological parameters. The Class I air dispersion modeling analysis was performed using the CALMET dataset which was developed through the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) Best Available Retrofit Technology (BART), commonly referred to as the VISTAS CALMET dataset. The VISTAS CALMET dataset is available for 5 sub domains. The VISTAS CALMET dataset for Sub Domain 1 was utilized for the Sipsey Wilderness Area; sub Domain 3 was utilized for the Mingo Wilderness Area.

The VISTAS CALMET dataset incorporated meteorological surface and upper air as well as precipitation stations which were provided to the CALMET model during processing. Monthly CALMET.DAT files were used for years 2001, 2002, and 2003. Ozone data were extracted using CalPro from a standard ozone dataset associated with the VISTAS CALMET dataset (Sub Domain 1 or 3).

Geophysical data such as terrain and land use is a necessary input to the CALMET model. The geophysical data utilized was included as part of the VISTAS CALMET dataset.

POSTUTIL (Version 1.56), a program that transforms particle size species to new species and produces the necessary concentration files that are then used by CALPOST for post-processing of results, was used for these analyses. The CALPOST model was used to calculate the concentration results for comparison to the modeling significance levels and the deposition flux for total sulfur and nitrogen. CALPOST was also used to carry out the visibility analysis. The CALPUFF modeling system switch settings and model options were based a combination of Interagency Workgroup on Air Quality Modeling (IWAQM) recommended switch settings and successive switch settings recommended in the Federal Land Managers (FLM) CALPUFF Reviewer's guide-FNL-20110523.

The air dispersion modeling analysis evaluated the potential impact of the emissions from proposed silicon manufacturing plant. Emission data and source characteristic information for the proposed silicon manufacturing plant were provided by Kennedy Jenks. Point, area, and volume sources were included in the model. Discrete receptors for Sipsey and Mingo Wilderness areas, downloaded from the National Park Service (NPS) web site at http://www.nature.nps.gov/air/maps/receptors/index.cfm were used to calculate air quality and visibility impacts.

The maximum concentrations of SO_2, NO_2, PM_{10}, and $PM_{2.5}$ at the Sipsey and Mingo Wilderness Areas were compared with Class I Significant Impact Levels (SILs). According to guidance, if maximum concentrations are below the SILs, then emissions from the facility are assumed to be insignificant and no further analysis is needed. Tables E-1 and E-2 present the results of the air dispersion modeling analysis for the Mississippi Silicon, LLC facility and compares the modeled concentrations at Sipsey and Mingo, respectively, to the Class I SILs. With the exception of three-hour and 24-hour SO_2 concentrations for 2001 and 2003, results indicate that all modeled concentrations are well below the SILs. For pollutant concentrations below the SIL, the emissions from the Mississippi Silicon, LLC facility are assumed to be insignificant which means that emissions from the proposed facility will not have the potential to cause or contribute to an exceedance of an ambient air quality standard or PSD increment. At this time the Mississippi Department of Environmental Quality (MDEQ) and FLM's have not required a cumulative increment analysis to be conducted.

Table E-1

CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Sipsey Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentration (µg/m³)			SIL Class I Standards (µg/m³)	% of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.8775	0.5986	**1.2454**	1.0	**124.5**
	3-hour (H2H)	0.6231	0.5672	0.9001	1.0	90.0
	24-hour (H1H)	**0.2371**	0.1958	**0.2551**	0.2	**127.5**
	24-hour (H2H)	0.1548	0.1947	**0.2235**	0.2	**111.7**
	Annual (H1H)	0.0074	0.0082	0.0104	0.1	10.4
NO_2	Annual (H1H)	0.0050	0.0058	0.0070	0.1	7.0
PM_{10}	24-hour (H1H)	0.0071	0.0046	0.0044	0.3	2.4
	24-hour (H2H)	0.0050	0.0031	0.0041	0.3	1.7
	Annual (H1H)	0.0002	0.0002	0.0002	0.2	0.11
$PM_{2.5}$	24-hour (H1H)	0.0139	0.0077	0.0081	0.07	19.8
	24-hour (H2H)	0.0074	0.0074	0.0072	0.07	10.62
	Annual (H1H)	0.0004	0.0003	0.0004	0.06	0.73

Table E-2

CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Mingo Wilderness Area

Pollutant	Averaging Time	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SO_2	3-hour (H1H)	0.0798	0.2387	0.1317	1.0	23.9
	3-hour (H2H)	0.0636	0.1173	0.0794	1.0	11.7
	24-hour (H1H)	0.0243	0.0563	0.0305	0.2	28.1
	24-hour (H2H)	0.0401	0.0313	0.0252	0.2	20.1
	Annual (H1H)	0.0006	0.0008	0.0008	0.1	0.85
NO_2	Annual (H1H)	0.0004	0.0002	0.0003	0.1	0.36
PM_{10}	24-hour (H1H)	0.0004	0.0011	0.0007	0.3	0.36
	24-hour (H2H)	0.0003	0.0006	0.0006	0.3	0.21
	Annual (H1H)	0.0000	0.0000	0.0000	0.2	0.01
$PM_{2.5}$	24-hour (H1H)	0.0012	0.0019	0.0020	0.07	2.9
	24-hour (H2H)	0.0010	0.0014	0.0019	0.07	2.7
	Annual (H1H)	0.0000	0.0000	0.0000	0.06	0.07

A visibility impairment analysis was conducted in order to determine if the Mississippi Silicon, LLC facility would have an adverse impact on visibility at the Sipsey and Mingo Wilderness Areas. The analysis was done using the CALPOST following the methods and options outlined under the FLAG 2010 guidance with MVISBK = 8 and the background light extinction based on the "cleanest 20%" days for each wilderness area. The visibility threshold is exceeded if the predicted change in light extinction exceeds 5% based on the 98th percentile (eighth highest day for a year) in any single year modeled. The CALPUFF/CALPOST visibility results for the Mississippi Silicon, LLC facility were compared to the "cleanest 20%" background and were found to be below the 5% (based on the 98th percentile calculation) for the cleanest 20% background condition. These results for Sipsey and Mingo Wilderness areas are presented in Tables E-3 and E-4, respectively.

Table E-3

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Sipsey Wilderness Areas

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	3.03%	3.20%	2.35%	64.0
2	2.90%	2.97%	2.19%	59.4
3	2.60%	2.41%	2.07%	52.0
4	2.54%	1.69%	1.98%	50.8
5	2.41%	1.68%	1.95%	48.2
6	2.13%	1.61%	1.95%	42.6
7	1.97%	1.59%	1.64%	39.4
8	1.69%	1.41%	1.58%	33.8

Table E-4

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Mingo Wilderness Areas

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	1.04%	0.46%	1.06%	21.2
2	0.55%	0.39%	0.99%	19.8
3	0.54%	0.37%	0.91%	18.2
4	0.52%	0.35%	0.70%	14
5	0.44%	0.29%	0.66%	13.2
6	0.37%	0.28%	0.51%	10.2
7	0.34%	0.25%	0.44%	8.8
8	0.30%	0.24%	0.34%	6.8

Total sulfur and total nitrogen deposition analyses were performed for Sipsey and Mingo Wilderness areas. For the deposition analysis, POSTUTIL was used to combine the wet and dry flux output files from CALPUFF and scale the contributions of SO_2, SO_4, NO_x, NO_3, and HNO_3 such that total nitrogen (N) and total sulfur (S) flux were contained in the same file. The model results were compared to the 0.01 kg/ha/year Deposition Analysis Threshold (DAT) developed by the NPS and the U.S. Fish and Wildlife Service (FWS) for the Eastern Class I Areas. The results of this analysis are provided in E-5 and E-6 for Sipsey and Mingo, respectively.

Table E-5

Sulfur and Nitrogen Deposition Flux Results for Sipsey Wilderness Area

Pollutant	Total Modeled Pollutant Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0068	0.0087	0.0087	0.01	87.1
Nitrogen (N)	0.0028	0.0036	0.0037	0.005	73.1

Table E-6

Sulfur and Nitrogen Deposition Flux Results for Mingo Wilderness Area

Pollutant	Total Modeled Pollutant Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0010	0.0010	0.0016	0.01	16.4
Nitrogen (N)	0.0005	0.0004	0.0007	0.005	14.8

Mississippi Silicon Class I SIL Analysis

SIL Analysis with visibility and deposition chemical transformation turned off in CALPUFF

Mingo

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (ug/m3)			SIL Class I Significant Impact Levels (ug/m3)	Maximum Percent of SIL
		2001	2002	2003		
SO2	3-hour (H1H)	0.3954	0.2921	0.1945	1.0	38.5%
	3-hour (H2H)	0.3723	0.1467	0.1854	1.0	37.2%
	24-hour (H1H)	0.1569	0.0741	0.0879	0.2	78.5%
	24-hour (H2H)	0.0585	0.0480	0.0636	0.2	31.8%
	Annual (H1H)	0.0022	0.0018	0.0023	0.1	2.3%
NO2	Annual (H1H)	0.0020	0.0016	0.0021	0.1	2.1%
PM10	24-hour (H1H)	0.0066	0.0021	0.0026	0.3	2.2%
	24-hour (H2H)	0.0025	0.0017	0.0025	0.3	0.8%
	Annual (H1H)	0.000094	0.000068	0.000095	0.2	0.0%
PM2.5	24-hour (H1H)	0.0056	0.0020	0.0022	0.07	8.0%
	24-hour (H2H)	0.0021	0.0015	0.0022	0.07	3.2%
	Annual (H1H)	0.000081	0.000069	0.000083	0.06	0.1%

Sipsey

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (ug/m3)			SIL Class I Significant Impact Levels (ug/m3)	Maximum Percent of SIL
		2001	2002	2003		
SO2	3-hour (H1H)	1.2540	1.0539	1.4318	1.0	143.0%
	3-hour (H2H)	1.1071	0.8076	0.9714	1.0	110.7%
	24-hour (H1H)	0.3146	0.2831	0.3141	0.2	157.1%
	24-hour (H2H)	0.2450	0.2335	0.2621	0.2	131.1%
	Annual (H1H)	0.0122	0.0130	0.0157	0.2	15.7%
NO2	Annual (H1H)	0.0106	0.0125	0.0139	0.1	13.9%
PM10	24-hour (H1H)	0.0178	0.0097	0.0160	0.3	5.9%
	24-hour (H2H)	0.0096	0.0091	0.0094	0.3	3.2%
	Annual (H1H)	0.0085	0.0005	0.0086	0.2	0.3%
PM2.5	24-hour (H1H)	0.0141	0.0085	0.0088	0.07	20.1%
	24-hour (H2H)	0.0075	0.0080	0.0082	0.07	11.7%
	Annual (H1H)	0.0004	0.0004	0.0004	0.06	0.9%

Table 3-5
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
$PM_{10}/PM_{2.5}$ Predicted Concentrations Compared to NAAQS – Multi-Source Modeling

PM_{10}	24-hour*	2007	20.48	07/10/05/24	378671.74	3852159.81	46	66.48	150	Sixth highest over 5 years (the NAAQS is not to be exceeded more than once per year on average)	No
		2008	23.04	08/10/05/24	378565.00	3851620.00	46	65.04			No
		2009	16.02	09/09/25/24	378739.55	3851798.96	46	62.02			No
		2010	18.04	10/07/04/24	378810.69	3852298.80	46	62.04			No
		2011	14.64	11/10/20/24	375965.00	3851928.80	46	60.64			No
		2007 - 2011	20.48	07/10/05/24	378671.74	3852159.81	46	66.48			No
$PM_{2.5}$	24-hour**	2007	6.63	–	378852.62	3852923.27	18.5	25.13	35	Average of the eighth highest (98th percentile) from each year	No
		2008	6.03	–	378867.69	3852798.78	18.5	24.53			No
		2009	6.07	–	378680.48	3852799.46	18.5	24.57			No
		2010	5.58	–	378788.95	3851768.56	18.5	24.18			No
		2011	5.69	–	378880.48	3851799.46	18.5	24.19			No
		2007 - 2011	5.58	–	378862.62	3852923.27	18.5	24.18			No
	Annual***	2007	2.83	–	378852.62	3852923.27	9.65	11.88	12	Average of the highest from each year	No
		2008	1.72	–	378852.62	3852923.27	9.65	11.37			No
		2009	1.86	–	379080.41	3852921.36	9.65	11.30			No
		2010	1.66	–	378880.48	3852798.80	9.65	11.31			No
		2011	1.89	–	378008.41	3852921.36	9.65	11.54			No
		2007 - 2011	1.55	–	378008.41	3852921.36	9.65	11.20			No

Notes:
*PM_{10} 24-Hour modeled concentrations based on high 1st high values
**$PM_{2.5}$ 24-Hour modeled concentrations based on 8th highest 24-hr results averaged over 1 year
***$PM_{2.5}$ Annual modeled concentrations based on maximum annual results averaged over 1 year

Table 3-6b
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
SO_2 Predicted Concentrations Compared to NAAQS - Multi-Source Modeling

SO_2*	1-hour	2007	68.89	–	439865.00	3852920.00	78.74	131.13	196	99th percentile (4th high) maximum daily 1-hour concentration averaged over 3-years	No
		2008	65.86	–	439865.00	3852920.00	78.74	136.40			No
		2009	68.36	–	421285.00	3849938.00	78.74	136.90			No
		2010	61.67	–	439865.00	3852920.00	78.74	132.41			No
		2011	47.25	–	428765.00	3852920.00	78.74	137.99			No
		2007 - 2011	–	–	–	–	–	–			–
	3-hour**	2007	35.96	07/09/25/25	379865.00	3852920.00	78.74	106.70	1,300	Highest of the second high from each of the 5 years	No
		2008	37.96	08/02/20/12	379865.00	3852920.00	78.74	108.79			No
		2009	44.64	09/12/27/25	379865.00	3852920.00	78.74	115.88			No
		2010	39.87	10/02/26/12	379865.00	3852920.00	78.74	109.81			No
		2011	34.62	11/03/23/12	379865.00	3852920.00	78.74	107.26			No
		2007 - 2011	–	–	–	–	–	–			–
	24-hour**	2007	13.74	07/09/15/24	379865.00	3852920.00	18.34	32.86	365	Highest of the second high from each of the 5 years	No
		2008	13.75	08/08/08/24	379865.00	3852920.00	18.34	32.09			No
		2009	14.60	09/04/17/24	379865.00	3852920.00	18.34	34.94			No
		2010	15.41	10/05/14/24	379865.00	3852920.00	18.34	33.75			No
		2011	14.10	11/05/20/24	379865.00	3852920.00	18.34	32.44			No
		2007 - 2011	–	–	–	–	–	–			–
	Annual	2007	2.70	–	379865.00	3852920.00	5.66	8.36	80	Highest of the 5 years	No
		2008	1.98	–	379865.00	3852920.00	5.66	7.64			No
		2009	1.99	–	379865.00	3852920.00	5.66	7.65			No
		2010	2.34	–	379865.00	3852920.00	5.66	7.99			No
		2011	2.26	–	379865.00	3852920.00	5.66	7.91			No
		2007 - 2011	–	–	–	–	–	–			–

Notes:
*The 1971 annual and 24-hour SO_2 standards were revoked in the final rule signed June 2, 2010.
**3-Hour and 24-Hour values based on HIGHEST 3-HR and 24-HR RESULTS - 1ST HIGH VALUE

Table 3-7d
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
NO_2 Predicted Concentrations Compared to NAAQS - Multi-Source Modeling

NO2 - Annual

NO_2	Annual	2007	9.76	--	379001.80	3852322.86	7.52	10.90	100	Average of the highest from each year		No
		2008	2.63	--	379001.80	3852322.86	7.52	10.15				No
		2009	2.80	--	379069.67	3852320.72	7.52	10.32				No
		2010	3.06	--	378779.15	3852748.94	7.52	10.53				No
		2011	3.18	--	379069.67	3852320.72	7.52	10.68				No
		2007 - 2011	--	--	--	--	--	--				--

Step 1 - NO_2 1-Hour - Full 50 km Grid

NO_2	1-Hour	2011	895.24	--	372965.00	3868020.00	63.92	959.16	188	Average of the eighth highest (98th percentile) maximum daily 1-hour concentration from each year	Yes

*Based on 1st-highest max daily 1-hr results

Step 2 - NO_2 1-Hour - Significant Impact Area (SIA) Only

NO_2	1-Hour	2011	454.13	11/01/11/01	412465.00	3866820.00	63.92	518.05	188	Average of the eighth highest (98th percentile) maximum daily 1-hour concentration from each year	Yes

*Based on 1st-highest max daily 1-hr results

Step 3 - NO_2 1-Hour - Identified Two (2) Critical Receptors. Re-Modeled All Sources on Critical Receptors (Meteorological Data Period - 2011)

SRCGP1 - All Sources	454.13	363.96
SRCGP2 - Columbia Gulf Transmission	38.48	32.56
SRCGP3 - Kingsford Manufacturing Company	0.71	0.82
SRCGP4 - Tilin Motorhomes Inc	21.18	23.32
SRCGP5 - OK Dri Production Company	4.98	6.41
SRCGP6 - TVA Magnolia Combined Cycle	1.56	1.54
SRCGP7 - Chevron Midstream Company	[illegible]	[illegible]
SRCGP8 - TX Eastern Transmission	11.37	11.89
SRCGP9 - TVA Colbert	20.99	21.72
SRCGP10 - MS Silicon	4.33	4.31
SRCGP11 - Packaging Corporation of America	5.13	6.27
SRCGP12 - Wise Alloys Plant	43.94	44.03

*Based on 1st-Highest max daily 1-hr results

Table 3-7d
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
NO_2 Predicted Concentrations Compared to NAAQS - Multi-Source Modeling

Step 4 - NO_2 1-Hour - Critical Receptors. All Sources (Includes Cherokee Nitrogen)

NO_2	1-Hour	2011	249.35	11/12/27/34	372985.00	3680020.00

*Based on 1st-highest max daily 1-hr results

Step 5 - NO_2 1-Hour - Critical Receptors and Source Contributions (Meteorological Data Period - 2012)

SRCGP1 - All Sources	180.78	189.98	235.35	241.76	157.06	168.84
SRCGP2 - Columbia Gulf Transmission	12.14	7.86	235.41	241.62	196.91	210.03
SRCGP3 - Kingsford Manufacturing Company	1.89	2.38	3.53	4.14	4.82	2.06
SRCGP4 - Tilth Materhomes Inc	15.47	10.56	10.77	12.29	10.84	9.57
SRCGP5 - Oil Dri Production Company	2.55	2.24	7.87	8.41	7.63	7.45
SRCGP6 - TVA Magnolia Combined Cycle	1.81	2.38	2.39	2.67	2.62	2.36
SRCGP7 - Cherokee Nitrogen Company	51.57	21.41	24.03	32.77	39.65	49.34
SRCGP8 - TX Eastern Transmission	5.44	5.49	2.96	2.13	2.58	2.70
SRCGP9 - TVA Colbert	15.89	14.83	4.42	5.16	4.89	6.84
SRCGP10 - MS Silicon	5.69	8.02	12.44	14.83	11.81	9.03
SRCGP11 - Packaging Corporation of America	14.71	15.80	11.35	18.46	13.40	16.28
SRCGP12 -Wise Alloys Plant	350.35	163.54	17.92	18.11	12.26	17.91

*Based on 1st-highest max daily 1-hr results

Step 6 - NO_2 1-Hour - 2 km Grid with Various Source Groups

SRCGP1 - All Sources	112.15	372985.00	3854020.00
SRCGP2 - Columbia Gulf Transmission	111.85	372985.00	3854020.00
SRCGP3 - All Sources Excluding Columbia Gulf	68.87	378051.08	3852095.12

*Based on 1st-highest max daily 1-hr results

Table 3-7d
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
NO2 Predicted Concentrations Compared to NAAQS - Multi-Source Modeling

Step 7 - NO2 1-Hour - Critical Receptors and Source Culpabilities (Meteorological Data Period - 2007 - 2010)

SRCGP1 - All Sources	106.45	111.80	254.02	230.72	154.51	180.44	157.91	130.15	240.82	215.87	158.82	183.62
SRCGP2 - Columbia Gulf Transmission	9.01	7.60	253.91	230.61	154.53	179.97	10.71	7.81	240.79	215.69	155.68	188.25
SRCGP3 - Kingsford Manufacturing Company	2.08	2.49	3.77	3.18	2.92	1.47	2.22	2.79	3.11	4.40	3.10	1.88
SRCGP4 - Yillin Motorhomes Inc	24.68	34.73	30.09	10.68	11.16	19.55	12.64	9.59	11.08	11.03	11.92	12.42
SRCGP5 - Oil Drl Production Company	1.37	1.02	8.88	8.40	8.04	8.78	2.83	2.50	8.79	7.99	8.39	7.42
SRCGP6 - TVA Magnolia Combined Cycle	2.51	3.23	2.49	2.52	2.56	2.04	2.35	3.99	1.93	1.97	2.80	3.46
SRCGP7 - Cherokee Nitrogen Company	64.82	28.76	30.97	34.18	30.39	35.94	55.41	28.10	35.36	30.43	24.64	44.05
SRCGP8 - TX Eastern Transmission	4.92	4.31	3.32	3.57	3.37	3.64	6.21	6.36	3.16	2.80	3.25	3.45
SRCGP9 - TVA Colbert	12.85	12.61	5.42	3.28	6.04	5.98	12.30	12.65	4.30	4.23	5.86	5.78
SRCGP10 - MS Silicon	7.76	9.60	12.59	13.82	13.49	8.43	7.63	9.52	6.75	8.28	11.39	9.91
SRCGP11 - Packaging Corporation of America	14.12	17.15	10.51	14.17	9.42	19.78	14.41	17.20	13.49	17.15	16.76	22.76
SRCGP12 - Wise Alloys Plant	106.22	111.60	15.83	15.96	11.57	22.84	157.57	129.86	16.96	17.23	13.91	20.67

*Based on 1st-highest max daily 1-hr results

SRCGP1 - All Sources	159.78	159.78	244.54	210.81	141.23	199.94	137.88	137.75	238.73	248.05	156.70	200.96
SRCGP2 - Columbia Gulf Transmission	9.81	8.38	2128.37	210.44	141.04	199.36	10.13	7.29	236.62	247.50	156.03	200.44
SRCGP3 - Kingsford Manufacturing Company	1.98	2.84	4.38	3.57	3.60	1.84	2.38	3.00	3.60	3.64	2.81	2.09
SRCGP4 - Yillin Motorhomes Inc	18.41	9.25	13.25	10.92	10.39	30.35	10.11	13.89	11.98	10.16	11.73	9.75
SRCGP5 - Oil Drl Production Company	2.84	1.93	9.31	7.37	8.24	7.68	3.09	2.74	7.53	8.16	8.78	7.87
SRCGP6 - TVA Magnolia Combined Cycle	2.76	3.07	2.41	2.47	2.27	2.01	2.33	2.80	2.02	2.85	1.29	2.00
SRCGP7 - Cherokee Nitrogen Company	45.75	18.40	27.32	35.92	24.82	42.53	43.48	30.90	33.01	34.45	39.79	42.45
SRCGP8 - TX Eastern Transmission	5.50	6.37	1.88	2.15	1.80	2.04	7.48	7.98	2.09	3.17	2.96	2.88
SRCGP9 - TVA Colbert	29.57	27.27	5.69	5.50	8.44	4.72	13.46	14.00	4.39	5.01	4.66	6.26
SRCGP10 - MS Silicon	6.43	10.00	12.91	15.90	9.44	7.91	6.96	10.93	8.67	8.12	11.28	11.34
SRCGP11 - Packaging Corporation of America	18.09	17.15	9.98	13.18	12.43	19.75	14.81	17.57	13.78	15.37	20.12	16.20
SRCGP12 - Wise Alloys Plant	153.39	138.42	16.86	17.23	17.39	20.20	137.67	137.50	15.79	15.88	16.38	15.90

*Based on 1st-highest max daily 1-hr results

Table 3-7e
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
NO_2 Predicted Concentrations Compared to NAAQS - MS Silicon Only

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NO_2	1-hour	2007	56.34	--	427925.00	3825820.00	63.92	120.16	188	Average of the eighth highest (98th percentile) maximum daily 1-hour concentration from each year	No
		2008	97.30	--	427925.00	3828520.00	63.92	161.02			No
		2009	94.27	--	427925.00	3828520.00	63.92	158.19			No
		2010	94.20	--	427925.00	3828520.00	63.92	158.12			No
		2011	105.38	--	427925.00	3828520.00	63.92	169.30			No
		2007 - 2011	--	--	--	--	--	--			--

Table 2-5
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to PSD Class II Increments - Based on Four (4) Submerged Arc Furnaces Operating Simultaneously

PM_{10}	24-hour	2007	16.07	07/08/09/24	379363.47	3852190.55	38	Highest of the second high from each of the 5 years	No
		2008	16.68	08/08/22/24	378365.00	3851520.00			No
		2009	14.46	09/09/23/24	378866.00	3852128.90			No
		2010	13.96	10/08/31/24	378852.62	3852923.27			No
		2011	13.49	11/08/22/24	378739.55	3851768.56			No
		2007 - 2011	16.68	--	378565.00	3851520.00			No
	Annual	2007	3.53	--	378852.62	3852928.27	17	Highest of the 5 years	No
		2008	2.98	--	378852.62	3852923.27			No
		2009	3.25	--	379000.41	3852921.36			No
		2010	3.25	--	379000.41	3852921.3			No
		2011	3.59	--	379049.67	3852920.72			No
		2007 - 2011	--	--	--	--			--
PM_{25}	24-hour	2007	7.55	07/07/16/24	378852.62	3852923.27	9	Highest of the second high from each of the 5 years	No
		2008	7.37	08/09/22/24	378565.00	3851820.00			No
		2009	7.12	09/11/23/24	378852.62	3852923.27			No
		2010	7.82	10/08/30/24	378810.99	3852298.80			No
		2011	6.74	11/11/06/24	378852.62	3852923.27			No
		2007 - 2011	7.05	--	378852.62	3852923.27			No
	Annual	2007	1.94	--	378852.62	3852923.27	4	Highest of the 5 years	No
		2008	1.66	--	378852.62	3852923.27			No
		2009	1.62	--	379000.41	3852921.36			No
		2010	1.61	--	379000.41	3852921.36			No
		2011	1.86	--	379000.41	3852921.36			No
		2007 - 2011	--	--	--	--			--
NO_2	Annual	2007	6.19	--	378886.76	3851765.89	25	Highest of the 5 years	No
		2008	4.57	--	378886.76	3851765.89			No
		2009	4.96	--	378788.62	3851767.67			No
		2010	5.48	--	378788.62	3851767.67			No
		2011	5.02	--	378788.62	3851767.67			No
		2007 - 2011	--	--	--	--			--
SO_2**	3-hour	2007	67.24	07/08/11/12	378865.00	3851420.00	512	Highest of the second high from each of the 5 years	No
		2008	62.72	08/07/17/12	378766.00	3852720.00			No
		2009	64.54	09/10/29/12	379165.00	3852620.00			No
		2010	68.90	10/09/06/15	379065.00	3852620.00			No
		2011	65.39	11/10/25/15	378865.00	3852620.00			No
		2007 - 2011	68.89	--	379065.00	3852620.00			No
	24-hour	2007	25.49	07/07/16/24	378965.00	3852720.00	91	Highest of the second high from each of the 5 years	No
		2008	25.45	08/06/07/24	379065.00	3852720.00			No
		2009	26.07	09/06/20/24	379065.00	3851620.00			No
		2010	24.85	10/07/08/24	379165.00	3852820.00			No
		2011	23.89	11/09/16/24	378565.00	3851420.00			No
		2007 - 2011	29.33	--	379065.00	3852120.00			No
	Annual	2007	4.79	--	378965.00	3852720.00	30	Highest of the 5 years	No
		2008	3.39	--	378865.00	3852920.00			No
		2009	3.47	--	379265.00	3852820.00			No
		2010	4.13	--	379265.00	3852720.00			No
		2011	4.00	--	379265.00	3852820.00			No
		2007 - 2011	--	--	--	--			--

Notes:

*Proposed MS Silicon project will trigger the PSD minor source baseline date for Tishomingo County. As a result, MS Silicon is the only Class II increment consuming source for the regulated air pollutants PM_{10}, PM_{25} and NO_2

**The minor source baseline date for SO_2 has already been set for the counties surrounding Tishomingo. There is only one other existing SO_2 source that consumes the increment. The predicted concentration for SO_2 reflects impacts from MS Silicon and Kingsford Manufacturing Company.

MINUTES OF THE MISSISSIPPI ENVIRONMENTAL QUALITY PERMIT BOARD HELD IN JACKSON, MISSISSIPPI, ON TUESDAY, JANUARY 14, 2014

The Mississippi Environmental Quality Permit Board held a meeting in the Commission Hearing Room of the Department of Environmental Quality, located at 515 East Amite Street, on January 14, 2014. Dennis Riecke called the meeting to order at 9:00 a.m. with the following members and designated representatives present:

Dennis Riecke, Chairman
Leslie Royals, Vice Chairman
Jan Boyd for Jamie Miller
Michael Bograd
Jamie Crawford for Kay Whittington
Jim Lipe for Cindy Hyde-Smith
David Snodgrass for Lisa Ivshin

Ted Lampton was present as legal counsel. On motion by David Snodgrass and seconded by Mike Bograd, the minutes of the regular meeting on December 10, 2013, were approved.

THE PERMIT BOARD CONSIDERED THE FOLLOWING OFFICE OF GEOLOGY MATTERS:

Mining and Reclamation Division

Surface Mining Bond Releases

The Permit Board on motion by Jim Lipe and seconded by Jan Boyd, voted to approve the issuance of the following bond releases: (Mike Bograd abstained)

APAC – Mississippi, Inc.	Carroll	P82-017T	Final 10%
Hill Brothers Construction Co., Inc.	Tunica	P12-009	Initial 90%
Pierce Construction and Contract Hauling, Inc.	Hinds	P09-009T1A	Initial 50%
TCB Construction Company, Inc.	Forrest	P01-030	Final 10%
TCB Construction Company, Inc.	Forrest	P01-031	Final 10%
Perkinston Sand & Gravel Company, Inc.	Stone	P87-004	Additional 40%
Perkinston Sand & Gravel Company, Inc.	Stone	P92-033	Additional 45%

Surface Mining Permit to Transfer

The Permit Board on motion by David Snodgrass and seconded by Jamie Crawford, voted to transfer the following surface mining permit and return the bond. (Mike Bograd abstained)

William Harvey d/b/a Viney Creek Gravel transfer to T & T Construction	Panola	P11-008T

EXHIBIT

"4"

MACLAND DISPOSAL, INC., CLASS I RUBBISH SITE, MOSS POINT, MISSISSIPPI COVERAGE #R1-109 – MACLAND'S MOTION TO DISMISS EVIDENTIARY HEARING REQUEST

The Permit Board held a hearing to consider MacLand Disposal Inc. II's (MacLand's) Motion to Dismiss Evidentiary Hearing Request filed by Ms. Gayla Crowley. Ms. Crowley specifically requested an evidentiary hearing for the Permit Board to consider issuance of Coverage under the Mississippi Solid Waste Management General Permit for operation of a Class I Rubbish Disposal Site located in Moss Point, Jackson County, Mississippi. MacLand moved to dismiss the hearing request arguing that Ms. Crowley presented no evidence that she was an "interested aggrieved" party, that she had shown no fact indicating MacLand failed to meet the requirements of the General Permit, and that Ms. Crowley otherwise lacked standing to pursue the request. Special Assistant Attorney General Deanna Saltzman served as a Hearing Officer. MacLand was represented by legal counsel Keith Turner, Esq. and Betty Ruth Fox, Esq. Mr. Turner made the argument on MacLand's behalf. Ms. Crowley represented herself and argued against the motion. MDEQ was represented by its General Counsel, Roy Furrh, and Senior Attorney Lisa Ouzts. Mr. Furrh related MDEQ's recommendation that the Permit Board deny the motion. After considering MacLand's written motion, written responses submitted by Ms. Crowley and MDEQ, and after considering the oral arguments of all the parties, Mr. Lipe moved to deny MacLand's Motion to Dismiss. Mr. Boyd seconded the motion and the Permit Board voted unanimously to deny MacLand's Motion to Dismiss. Mr. Turner requested that the Board bar Ms. Crowley from introducing anything at the evidentiary hearing related to the Permit Board's prior decision, made after an evidentiary hearing held on August 21, 2012, to approve modification of MacLand's permit noting that Ms. Crowley did not appeal the decision. Ms. Crowley agreed that she would not raise issues that the Permit Board previously decided.

REPORT OF STAFF PERMIT ACTIONS/CERTIFICATIONS

Staff reported to the Permit Board that staff had taken action on various permits since the December 10, 2013, Permit Board Meeting pursuant to the regulations delegating this authority to the Executive Director and the Executive Director's delegation of this authority to the staff in accord with those regulations. The Permit Board voted to note and record in its minutes the reports of permit actions/certifications by staff since the December 10, 2013, Permit Board Meeting. [Jamie Crawford abstained from voting on all Land and Water Resources permits and Mike Bograd abstained on all of the Office of Geology permits.]

REPORT OF PERMIT ACTIONS / CERTIFICATIONS SINCE THE 12/10/2013 MEETING
OFFICE OF POLLUTION CONTROL
ENVIRONMENTAL PERMITS DIVISION

Air - Construction Permit Issuance			
ID	Facility	County	Permit No.
63214	Enable Midstream Partners LP, Ash Plant	Amite	0080-00036
1021	Homen Industries	Itawamba	1240-00007

Air - Permit Revoke			
ID	Facility	County	Permit No.
6377	Carpenter Company	Lee	1540-00024
2008	Mid South Lumber Inc	Lauderdale	1460-00012

20543	Denbury Onshore LLC, Soso Central Processing Facility	Jasper	1300-00071
2082	Entergy Mississippi Inc, Grand Gulf Nuclear Station	Claiborne	0420-00023
12360	Foamcraft Inc	Lee	1540-00072
1332	Roura Material Handling Inc	Marshall	1760-00030

Air - Title V Operating Permit Issuance			
ID	Facility	County	Permit No.
23844	Gulf LNG Energy LLC, LNG Clean Energy Project	Jackson	1280-00132

Air - Title V Operating Permit Modification			
ID	Facility	County	Permit No.
952	Norbord Industries Inc	Lee	1540-00058

Air - Title V Operating Permit Reissuance			
ID	Facility	County	Permit No.
5316	Builders Marble Inc	Hinds	1080-00234
6377	Carpenter Company	Lee	1540-00024
2008	Mid South Lumber Inc	Lauderdale	1460-00012
5106	Tennessee Gas Pipeline Company LLC, Batesville Compressor Station Number 63	Panola	2100-00023
919	Trulite Glass and Aluminum Solutions	Grenada	0960-00001

Air - Title V Operating Permit Transfer			
ID	Facility	County	Permit No.
922	Transferred To: Chromcraft Furniture, A Subsidiary of Sport Haley Holdings IncTransferred From: Chromcraft Furniture	Tate	2600-00003

Air - Title V Permit Minor Modification			
ID	Facility	County	Permit No.
12439	Gulf South Pipeline Company, LP Jackson Compressor Station	Rankin	2380-00096
902	Resolute FP US Inc, Grenada Operations	Grenada	0960-00015

Surface Water - General Permit Coverages - Other Issuances			
ID	Facility	County	Permit No.
64921	Harrell Family Farms	Scott	MSG201737
24474	PPM Consultants Inc, Jr Food Mart Number 472	Wilkinson	MSG120228
24072	Scott Petroleum Corporation, Greenville Facility	Washington	MSG130410
65155	Southeast Supply Header LLC, SESH Line 100 at Bayou Pierre	Claiborne	MSG130411

Surface Water - General Permit Coverages - Other Modification			
ID	Facility	County	Permit No.
55156	Coty and Tamara Blakeney, Poultry	Jasper	MSG201643

Surface Water - General Permit Coverages - Other Transfer			
ID	Facility	County	Permit No.
52491	Transferred To: Diamond V Poultry LLCTransferred From: Lela Simmons, Poultry	Marion	MSG201583
9379	Transferred To: Donald A Robertson, Poultry Farm 7-12Transferred From: John Koehler, Poultry	Pike	MSG201671

64893	Field Memorial Hospital	Wilkinson	MSR106486
65021	Ingomar Water Association, Highway 15 Water Line Relocation	Union	MSR106509
229	Johns Manville	Adams	MSR106521
868	Keesler Air Force Base	Harrison	MSR106518
65061	MDOT, Yazoo, 103321 301000	Yazoo	MSR106515
64412	Memphis Stone and Gravel Company, DeSoto Plant Mine	Desoto	MSR322329
65030	N L Carson Construction Company Inc, Massey Mine	Attala	MSR322357
64953	Neely Trucking and Excavating, Pocahontas Mine	Hinds	MSR322369
64956	Old Highway 49 Subdivision	Harrison	MSR106502
65044	Parmen Energy, Olive Branch Facility	Desoto	MSR106513
65071	Pascagoula, City of, Point Park Redevelopment	Jackson	MSR106517
56726	Quality Manufacturing Group	Marion	MSR002157
65028	Singing River Mall Demolition Project	Jackson	MSR106519
65096	Talbot Brothers Grading Company Inc, Carpenter Mine	Marshall	MSR322358
64968	US Army COE, Vicksburg District, Avon Seepage Control	Washington	MSR106505
64966	US Army COE, Vicksburg District, Lake Jackson Seepage Control	Issaquena	MSR106504
64736	W S Newell and Sons Inc, Nichols Mine	Marshall	MSR322346
65102	White Track Subdivision	Harrison	MSR106520
64971	Xcavators Inc, Porch Mine	Union	MSR322355

Surface Water - General Permit Coverages - Storm Water Modification			
ID	Facility	County	Permit No.
36668	Green Brothers Gravel Company Inc, Bradley Mine Number Six, Plant 15	Marion	MSR321746
19374	Oxford Commons	Lafayette	MSR104127
19374	Oxford Commons	Lafayette	MSR104127

Surface Water - General Permit Coverages - Storm Water Reissuance			
ID	Facility	County	Permit No.
38499	Doug McCormick Construction, Swan Hill Mine	Monroe	MSR321742
15949	Dunn Roadbuilders LLC, Hayes Pit	Clarke	MSR320971
38238	Ellis Construction Company Inc, S and E Land Holdings Mine	Lowndes	MSR321819
37200	Endville Properties LLC, Endville Mine	Pontotoc	MSR321770
36209	Eutaw Construction Company Inc, Ford Mine	Itawamba	MSR321727
52629	GM Tootle Enterprises LLC, Tootle Mine	Jackson	MSR321977
11932	Johnstons Sand and Gravel Inc, Pit Number 3	Clarke	MSR322071
4863	Johnstons Sand and Gravel Inc, Pit Number 7	Clarke	MSR320193
16376	Krystal Gravel Inc, Vaughn Gravel Pit	Copiah	MSR320019
56113	L Bs Sales, L Bs Sales Mine	Stone	MSR322131
35877	M Matt Durand LLC, Port Bienville Clay Borrow Mine	Hancock	MSR321824
56073	Profile Products LLC, Mine Number 4	Tippah	MSR322129
38001	Riverwind Construction Inc, Riverwind Borrow Mine	Rankin	MSR321806
37956	Smith Gravel and Trucking LLC, Chris Smith Mine	Pearl River	MSR321814
56032	Tanner Construction Company Inc, Arthur Mine	Leake	MSR322122
55874	Tanner Construction Company Inc, Hollingshead Mine	Jasper	MSR322114
37393	Tanner Construction Company Inc, Jason Raiham Mine	Perry	MSR321779
56131	Tanner Construction Company Inc, Keyes Mine	Jasper	MSR322134

Surface Water - Commercial - NPDES Permit Issuance			
ID	Facility	County	Permit No.
64776	MDOT, 5th District Complex	Newton	MS0062090
64775	MDOT, Leake County Maintenance Headquarters	Leake	MS0062103
64774	MDOT, Scott County Maintenance Headquarters	Scott	MS0062081

Surface Water - Commercial - NPDES Permit Reissuance			
ID	Facility	County	Permit No.
14203	50 West Laundry and Car Wash	Clay	MS0049239
13943	A 1 Trailer Park	Lamar	MS0039331
17867	Davids Mobile Home Park	Claiborne	MS0058726
14161	Five County Child Development Program Inc, Monticello Head Start Center Number 2	Lawrence	MS0048143
13886	H and H Estate Inc	Lauderdale	MS0036919
13845	Jefferson Davis County Schools, Jefferson Davis Vo Tech Center	Jefferson Davis	MS0035009
14168	Kellys Countryside Mobile Home Park	Lauderdale	MS0048241
13651	MDOT, Interstate 55, Welcome Center, Pike	Pike	MS0024538
13872	N C Carwash	Hinds	MS0036471
13849	NTS Association Inc, Tanglewood Subdivision	Lauderdale	MS0035190
13740	North Pike Consolidated School District, North Pike Middle School	Pike	MS0031097
14393	North Point Inc, North Point Megamart and Fueling Center	Prentiss	MS0065433
14294	Oxford, City of, Deerfield Subdivision	Lafayette	MS0062698
14038	Pierce Trailer Park, Number 1	Warren	MS0043729
13959	R D Mobile Home Park	Forrest	MS0040070
14416	Region 1 Mental Health Center, Fairland Center	Coahoma	MS0055930
14295	Rock Hill Baptist Church	Rankin	MS0052744
13985	Slays Trailer Park	Forrest	MS0041939
13864	Wash Spot LLC, The	Franklin	MS0036013
14266	Western Line School District, Riverside High School	Washington	MS0051527
13863	Wilco Properties Inc, New Hope Park Subdivision	Lowndes	MS0035921

Surface Water - Commercial - NPDES Permit Transfer			
ID	Facility	County	Permit No.
14358	Transferred To: Utility Services LLC, Mill Creek SubdivisionTransferred From: TESI, Mill Creek Subdivision	Warren	MS0054721
13837	Transferred To: Utility Services LLC, Bernard Acres SubdivisionTransferred From: TESI, Bernard Acres Subdivision	Warren	MS0034681
13912	Transferred To: Utility Services LLC, Blakely Sewage District SubdivisionTransferred From: TESI, Blakely Sewage District Subdivision	Warren	MS0038512
13894	Transferred To: Utility Services LLC, Dogwood Lake EstatesTransferred From: TESI, Dogwood Lake Estates	Warren	MS0037851
13868	Transferred To: Utility Services LLC, Greenbriar SubdivisionTransferred From: TESI, Greenbriar Subdivision	Warren	MS0036188
13843	Transferred To: Utility Services LLC, Lake Village Estates and WindanceTransferred From: TESI, Lake Village Estates	Harrison	MS0023523
13990	Transferred To: Utility Services LLC, Lower Woodville EstatesTransferred From: TESI, Lower Woodville Estates	Adams	MS0042072
[illegible]	Transferred To: Utility Services LLC, Oak Grove Subdivision and Oak Grove TownhousesTransferred	Lamar	MS0034808

13823	Transferred To: Utility Services LLC, Villanova SubdivisionTransferred From: Total Environmental Solutions Inc, Villanova Subdivision	Warren	MS0034215
13723	Transferred To: Utility Services LLC, Woodland Acres SubdivisionTransferred From: TESI, Woodland Acres Subdivision	Rankin	MS0030252
13612	Transferred To: Utility Services, LLC, Oak Harbor SubdivisionTransferred From: TESI, Oak Harbor Subdivision	Hancock	MS0021881

Surface Water - Commercial NPDES Permit- Revoke			
ID	Facility	County	Permit No.
14203	50 West Laundry and Car WashRevoke and Reissue	Clay	MS0049239

Surface Water - Commercial NPDES Permit - Revoke			
ID	Facility	County	Permit No.
13943	A 1 Trailer Park	Lamar	MS0039331
17867	Davids Mobile Home Park	Claiborne	MS0058726
13886	H and H Estate Inc	Lauderdale	MS0038919
13845	Jefferson Davis County Schools, Jefferson Davis Vo Tech Center	Jefferson Davis	MS0035009
14168	Kellys Countryside Mobile Home Park	Lauderdale	MS0048241
13651	MDOT, Interstate 55, Welcome Center, Pike	Pike	MS0024538
13872	N C Carwash	Hinds	MS0036471
13849	NTS Association Inc, Tanglewood Subdivision	Lauderdale	MS0035190
13740	North Pike Consolidated School District, North Pike Middle School	Pike	MS0031097
14393	North Point Inc, North Point Megamart and Fueling CenterRevoke and Reissue	Prentiss	MS0055433
14294	Oxford, City of, Deerfield Subdivision	Lafayette	MS0052898
14038	Pierce Trailer Park, Number 1	Warren	MS0043729
13959	R D Mobile Home Park	Forrest	MS0040070
14416	Region 1 Mental Health Center, Fairland Center	Coahoma	MS0055930
14295	Rock Hill Baptist Church	Rankin	MS0052744
13985	Slays Trailer Park	Forrest	MS0041939
13864	Wash Spot LLC, The	Franklin	MS0036013
14266	Western Line School District, Riverside High School	Washington	MS0051527
13863	Wilco Properties Inc, New Hope Park Subdivision	Lowndes	MS0035921

Surface Water - General Permit Coverages - Storm Water Transfer			
ID	Facility	County	Permit No.
56728	Transfer of Owner To: J. W. McCurdy, RMC Development LLC, Southpointe Subdivision TwoTransfer of Owner From: Renesant Bank, Southpointe Subdivision Two	Lafayette	MSR106069
18987	Transfer of Owner To: Pearl River County Utility Authority, Wildwood Utilities LLC, Wildwood SubdivisionTransfer of Owner From: Mr. E. C. Stewart Jr. and Deborah Jabour Stewart, Wildwood Utilities LLC, Wildwood Subdivision	Pearl River	MSR103380

Surface Water - Industrial - NPDES Permit - Modification			
ID	Facility	County	Permit No.
1358	Motiva Enterprises LLC, Collins Terminal	Covington	MS0002968

Surface Water - Industrial - NPDES Permit - Revoke			
ID	Facility	County	Permit No.
	Cooper Marine and Timberlands CorporationPermit being		

Surface Water - Industrial - Pretreatment Permit Transfer			
ID	Facility	County	Permit No.
22764	Transfer Of Owner To: Grenada Stamping and Assembly IncTransfer Of Owner From: Grenada Manufacturing LLC	Grenada	MSP092210
922	Transferred To: Chromcraft Furniture, A Subsidiary of Sport Haley Holdings IncTransferred From: Chromcraft Furniture	Tate	MSP090234

Surface Water - Industrial - State Operating Permit Reissuance			
ID	Facility	County	Permit No.
14585	Singing River Hospital System, East Central Medical Center	Jackson	MSU097021

Surface Water - Industrial General Permit Coverage - Stormwater - Transfer			
ID	Facility	County	Permit No.
922	Transferred To: Chromcraft Furniture, A Subsidiary of Sport Haley Holdings IncTransferred From: Chromcraft Furniture	Tate	MSR110096
1332	Transferred To: Roura Material Handling IncTransferred From: Roura Iron Works Inc	Marshall	MSR000359

Surface Water - Industrial General Permit Coverage - Revoke			
ID	Facility	County	Permit No.
37849	MDOT, Jasper, 102455301000	Jasper	MSR105180
23257	MDOT, Lauderdale, Newton, Neshoba, 101648	Lauderdale	MSR103884
53551	MDOT, Leake, 100490 302000	Leake	MSR105759

Surface Water - Industrial General Permit Coverage - Stormwater - Revoke			
ID	Facility	County	Permit No.
63806	Kroger Fuel Center Number V 493	Rankin	MSR106379
63796	MDOT, Scott, 105057 301000	Scott	MSR106376
1478	Praxair Inc	Rankin	MSR001146
56231	Tennessee Valley Authority, Clayton Village 161kV Switching Station	Oktibbeha	MSR106020
57299	Winston County Board of Supervisors, PLH-0673(3)B	Winston	MSR106135

Surface Water - Municipal - NPDES Permit - Revoke			
ID	Facility	County	Permit No.
13210	Kilmichael POTW	Montgomery	MS0020001
13444	Water Valley POTW	Yalobusha	MS0022331

Surface Water - Municipal - NPDES Permit Reissuance			
ID	Facility	County	Permit No.
13005	Ackerman POTW	Choctaw	MS0020575
13109	Doddsville POTW	Sunflower	MS0044458
13116	Ecru POTW	Pontotoc	MS0035173
13210	Kilmichael POTW	Montgomery	MS0020001
13324	Pachuta POTW	Clarke	MS0035700
37819	Pearl River County Utility Authority, Neal Road POTW	Pearl River	MS0061174
13368	Roxie POTW	Franklin	MS0024830
13444	Water Valley POTW	Yalobusha	MS0022331

REPORT OF PERMIT ACTONS/CERTIFICATIONS SINCE THE 12/10/2013 MEETING
OFFICE OF GEOLOGY
MINING AND RECLAMATION DIVISION

Permit(s) Issued			
ID	Facility	County	Permit No.
64736	W S Newell and Sons Inc, Nichols Mine	Marshall	P13-026

Permit(s) Modified with Acreage			
ID	Facility	County	Permit No.
10290	Golden Triangle Sand and Gravel Inc	Lowndes	P96-041
36668	Green Brothers Gravel Company Inc, Bradley Mine Number Six, Plant 15	Marion	P08-010AAA

Permit(s) Reissued			
ID	Facility	County	Permit No.
6702	Hammett Gravel Company Inc, McGlone Pit	Yazoo	P04-010
1592	Newell Sand and Gravel Company, Newell Sand and Gravel Mine	Harrison	P94-035A

OFFICE OF LAND AND WATER RESOURCES
REPORT OF PERMIT ACTIONS/CERTIFICATIONS SINCE THE LAST MEETING OF 12/10/2013

OWNER NAME	COUNTY	VOLUME (MGD)	VOLUME (AF/YR)	RATE (GPM)	SOURCE	PERMIT NUMBER	AGENCY
Groundwater Applications							
CLINTON, CITY OF	HINDS	0.46	515	1000	CCKF	MS-GW-17043	DEQ
CMS SUBDIVISION LLC	HINDS	0.46	515	1000	CCKF	MS-GW-17044	DEQ
CONNELL, BETTY M	SUNFLOWER	0.29	330	2800	MRVA	MS-GW-42498	YMD
REED JR, JAMES E	SUNFLOWER	0.13	150	2500	MRVA	MS-GW-47721	YMD
PANTHER BURN LAND COMPANY LLC	SHARKEY	0.09	98	2500	MRVA	MS-GW-47753	YMD
HIRSBERG, GEORGE	COAHOMA	0.04	40	900	MRVA	MS-GW-47754	YMD
NICHOLSON, BRAD	YAZOO	0.17	185	1800	MRVA	MS-GW-47758	YMD
LONESTAR PLANTATION	SHARKEY	0.11	120	2500	MRVA	MS-GW-47760	YMD
LONESTAR PLANTATION	SHARKEY	0.23	255	2500	MRVA	MS-GW-47761	YMD
LONESTAR PLANTATION	YAZOO	0.11	120	2500	MRVA	MS-GW-47762	YMD
MURPHEY JR, JOSEPH R	TALLAHATCHIE	0.13	150	1500	MRVA	MS-GW-47763	YMD
GOOSE POND AG INC	SUNFLOWER	0.04	42	750	MRVA	MS-GW-47764	YMD

FANCHER FARMS	CARROLL	0.20	225	2500	MRVA	MS-GW-47765	YMD
O F BLEDSOE PLANTATION	LEFLORE	0.15	167	800	MRVA	MS-GW-47766	YMD
RANDLE, WILLIAM S	LEFLORE	0.16	183	2500	MRVA	MS-GW-47767	YMD
RANDLE, WILLIAM S	LEFLORE	0.08	89	2500	MRVA	MS-GW-47768	YMD
BLACKWOOD PLANTATION	WASHINGTON	0.15	173	3000	MRVA	MS-GW-47769	YMD
BLACKWOOD PLANTATION	WASHINGTON	0.21	240	3000	MRVA	MS-GW-47770	YMD
N AND N FARMS	BOLIVAR	0.22	246	2500	MRVA	MS-GW-47771	YMD
N AND N FARMS	BOLIVAR	0.25	276	2500	MRVA	MS-GW-47772	YMD
ROBINSON, BRETT	YAZOO	0.21	237	2800	MRVA	MS-GW-47776	YMD
RIVERBANK FARMS	YAZOO	0.07	75	2500	MRVA	MS-GW-47777	YMD
RIVERBANK FARMS	YAZOO	0.06	63	2500	MRVA	MS-GW-47778	YMD
RIVERBANK FARMS	YAZOO	0.07	81	2500	MRVA	MS-GW-47779	YMD
PARKER, ROY O	HUMPHREYS	0.05	53	800	MRVA	MS-GW-47790	YMD
PARKER, ROY O	HUMPHREYS	0.06	72	800	MRVA	MS-GW-47791	YMD
PEASTER, MARY JANE	YAZOO	0.19	210	2500	MRVA	MS-GW-47792	YMD

PEASTER, MARY JANE	YAZOO	0.21	240	2500	MRVA	MS-GW-47793	YMD
PARTRIDGE, ALTHEA	YAZOO	0.11	120	2500	MRVA	MS-GW-47794	YMD
PARTRIDGE, ALTHEA	YAZOO	0.13	150	2500	MRVA	MS-GW-47795	YMD
PARTRIDGE, ALTHEA	YAZOO	0.21	240	2500	MRVA	MS-GW-47796	YMD
PARTRIDGE, ALTHEA	YAZOO	0.11	120	2500	MRVA	MS-GW-47797	YMD
FOUCHE, JOHN	YAZOO	0.11	120	2500	MRVA	MS-GW-47798	YMD
HEIRS OF J M HOWARD LLC	HOLMES	0.09	102	2500	MRVA	MS-GW-47802	YMD
WINGATE, SAFRONIA	BOLIVAR	0.05	60	1000	MRVA	MS-GW-47803	YMD
CONWAY, JOHN	QUITMAN	0.04	40	1000	MRVA	MS-GW-47804	YMD
FULL HARVEST AGRICULTURE	SUNFLOWER	0.07	75	800	MRVA	MS-GW-47805	YMD
DELTA PINE LAND COMPANY LP	BOLIVAR	0.26	291	2000	MRVA	MS-GW-47806	YMD
DELTA PINE LAND COMPANY LP	BOLIVAR	0.11	120	2500	MRVA	MS-GW-47807	YMD
DELTA PINE LAND COMPANY LP	BOLIVAR	0.09	102	2500	MRVA	MS-GW-47808	YMD
DELTA PINE LAND COMPANY LP	BOLIVAR	0.11	120	2500	MRVA	MS-GW-47809	YMD
FALLS, GARNER	TALLAHATCHIE	0.24	270	2500	MRVA	MS-GW-47810	YMD

ESPERANZA PLANTING COMPANY	ISSAQUENA	0.02	17	1500	MRVA	MS-GW-47811	YMD
ESPERANZA PLANTING COMPANY	ISSAQUENA	0.10	113	3000	MRVA	MS-GW-47812	YMD
ESPERANZA PLANTING COMPANY	ISSAQUENA	0.10	113	3000	MRVA	MS-GW-47813	YMD
ESPERANZA PLANTING COMPANY	ISSAQUENA	0.17	188	3000	MRVA	MS-GW-47814	YMD
BRASWELL, DENON	HUMPHREYS	0.27	300	2500	MRVA	MS-GW-47816	YMD
HOLTON, ALVIN	HUMPHREYS	0.14	155	2500	MRVA	MS-GW-47817	YMD
MUIRHEAD, PAUL	SHARKEY	0.28	318	2500	MRVA	MS-GW-47818	YMD
DAVIDSON, RUDY	LEFLORE	0.27	300	2500	MRVA	MS-GW-47819	YMD
CLARK AND CLARK	COAHOMA	0.27	305	1600	MRVA	MS-GW-47820	YMD
ALFORD III, S F	ISSAQUENA	0.14	155	850	MRVA	MS-GW-47821	YMD
JWB MS LLC	SUNFLOWER	0.27	300	2500	MRVA	MS-GW-47822	YMD
MAHALITC, GEORGE	SHARKEY	0.30	333	2800	MRVA	MS-GW-47823	YMD
MAHALITC, GEORGE	SHARKEY	0.28	315	2800	MRVA	MS-GW-47824	YMD
MAHALITC, GEORGE	SHARKEY	0.20	222	2800	MRVA	MS-GW-47825	YMD
FARMERS NATIONAL	COAHOMA	0.10	113	2200	MRVA	MS-GW-47828	YMD

FARMERS NATIONAL	COAHOMA	0.22	248	2200	MRVA	MS-GW-47829	YMD
HALL, LARRY	SUNFLOWER	0.20	225	2200	MRVA	MS-GW-47830	YMD
WATTS PLANTING COMPANY	BOLIVAR	0.12	135	2200	MRVA	MS-GW-47831	YMD
GOODRICH LIVESTOCK COMPANY	WASHINGTON	0.09	105	1600	MRVA	MS-GW-47832	YMD
GOOD, STEVEN P	SUNFLOWER	0.35	390	2500	MRVA	MS-GW-47833	YMD
GOOD, STEVEN P	SUNFLOWER	0.21	240	2500	MRVA	MS-GW-47834	YMD
QUIVER RIVER FARMS INC	LEFLORE	0.57	640	3000	MRVA	MS-GW-47835	YMD
BOONE FARMS 3	WASHINGTON	0.43	480	2500	MRVA	MS-GW-47837	YMD
MARTIN MYERS FARMS	WASHINGTON	0.04	45	600	MRVA	MS-GW-47838	YMD
HOPE SO FARMS	SUNFLOWER	0.12	138	3500	MRVA	MS-GW-47840	YMD
WAXHAW LAND CORPORATION	BOLIVAR	0.46	510	1900	MRVA	MS-GW-47841	YMD
FLAUTT, MICHAEL B	TALLAHATCHIE	0.36	400	2500	MRVA	MS-GW-47842	YMD
YARBROUGH, SCOTT	SUNFLOWER	0.09	105	1000	MRVA	MS-GW-47844	YMD
CROSBY CONSORTIUM	BOLIVAR	0.11	120	1300	MRVA	MS-GW-47845	YMD
SCHMIDT, DALE	BOLIVAR	0.16	174	2200	MRVA	MS-GW-47846	YMD

KLINE JR, JAMES R, ESTATE	BOLIVAR	0.20	228	2500	MRVA	MS-GW-47847	YMD
KLINE JR, JAMES R, ESTATE	BOLIVAR	0.18	201	2500	MRVA	MS-GW-47848	YMD
AGUZZI FARMS	BOLIVAR	0.80	900	2400	MRVA	MS-GW-47849	YMD
BELL AND BELL PARTNERSHIP	BOLIVAR	0.21	240	2500	MRVA	MS-GW-47850	YMD
NARON, ROBERT	BOLIVAR	0.27	306	2500	MRVA	MS-GW-47851	YMD
KILLEBREW, HEATH AND KEITH	HOLMES	0.24	264	1500	MRVA	MS-GW-47855	YMD
PILLOW III, WALTER R	LEFLORE	0.12	135	800	MRVA	MS-GW-47858	YMD
GUS PIERALISI AND SONS	WASHINGTON	0.07	75	1800	MRVA	MS-GW-47863	YMD
BECKHAM BROTHERS	SUNFLOWER	0.09	105	1200	MRVA	MS-GW-47864	YMD
J AND B HERBERT LLC	BOLIVAR	0.04	45	1000	MRVA	MS-GW-47865	YMD
BEAR WALLOW INC	SUNFLOWER	0.20	225	2500	MRVA	MS-GW-47868	YMD
CLINKSCALES ASSOCIATES	SHARKEY	0.11	120	2200	MRVA	MS-GW-47880	YMD
CLINKSCALES ASSOCIATES	SHARKEY	0.11	120	2800	MRVA	MS-GW-47881	YMD
Groundwater Modifications							
BASS, BRENT	COAHOMA	0.35	393	1900	MRVA	MS-GW-00162	YMD

MARTIN, JACKY	SHARKEY	0.10	113	3000	MRVA	MS-GW-03668	YMD
NEBLETT, G RIVES	COAHOMA	0.34	378	2500	MRVA	MS-GW-05619	YMD
FORREST CITY FARMS	WASHINGTON	0.29	320	2000	MRVA	MS-GW-09370	YMD
LEROY PLANTATION INC	WASHINGTON	0.24	265	2600	MRVA	MS-GW-10685	YMD
LEROY PLANTATION INC	WASHINGTON	0.20	225	2200	MRVA	MS-GW-10688	YMD
REED JR, JAMES	SUNFLOWER	0.16	180	1350	MRVA	MS-GW-11842	YMD
PARKER, E L	HUMPHREYS	0.36	405	3000	MRVA	MS-GW-38203	YMD
COLEMAN, STAFFORD AND ALICE	BOLIVAR	0.09	105	2500	MRVA	MS-GW-38312	YMD
BERRYHILL, LAMAR	COAHOMA	0.17	195	2000	MRVA	MS-GW-39877	YMD
BASS, BRENT	COAHOMA	0.25	285	3000	MRVA	MS-GW-40419	YMD
LEROY PLANTATION INC	WASHINGTON	0.43	480	2200	MRVA	MS-GW-44356	YMD
BERCLAIR FARMS	LEFLORE	0.07	80	800	MRVA	MS-GW-45006	YMD
COTTONDALE INC	SUNFLOWER	0.35	396	1500	MRVA	MS-GW-47733	YMD
Groundwater Renewals							
WAITS AND WESTMORELAND	SUNFLOWER	0.27	300	1200	MRVA	MS-GW-00360	YMD

HOLLY RIDGE PLANTING COMPANY	WASHINGTON	0.13	150	2000	MRVA	MS-GW-04044	YMD
WADE FARMS INC	ISSAQUENA	0.40	450	3000	MRVA	MS-GW-05684	YMD
BURNS, DELTON	BOLIVAR	0.19	210	3000	MRVA	MS-GW-05905	YMD
GEORGE, H S	PANOLA	0.11	120	2000	MRVA	MS-GW-08246	YMD
GEORGE, H S	PANOLA	0.80	900	3000	MRVA	MS-GW-08248	YMD
BILLUPS PLANTATION INC	HUMPHREYS	0.14	157	600	MUWX	MS-GW-10145	DEQ
DURAJ AND DURAJ PARTNERSHIP	BOLIVAR	0.24	270	2000	MRVA	MS-GW-10292	YMD
DEOVELENTE FARMS	HUMPHREYS	0.16	180	1000	MRVA	MS-GW-10391	YMD
PARKINSON JR, RILEY	BOLIVAR	0.17	191	2000	MRVA	MS-GW-10506	YMD
SHAMROCK FARMS INC	WASHINGTON	0.32	360	2000	MRVA	MS-GW-10862	YMD
ELMWOOD RICE FARMS INC	WASHINGTON	0.43	480	1700	MRVA	MS-GW-10869	YMD
NICHOLS III, H L	HOLMES	0.17	188	900	MRVA	MS-GW-11259	YMD
KLINE JR, JAMES R, ESTATE	BOLIVAR	0.20	225	1500	MRVA	MS-GW-11521	YMD
DEOVELENTE FARMS	HUMPHREYS	0.19	216	2000	MRVA	MS-GW-12747	YMD
JOHNSON, ROGER, ESTATE	TUNICA	0.34	383	2700	MRVA	MS-GW-13502	YMD

RICHEY, WILLIS	LEE	0.01	11	30	ETMS	MS-GW-14392	DEQ
RICHEY, WILLIS	LEE	0.01	11	40	ETMS	MS-GW-14393	DEQ
SESSUMS WATER ASSOCIATION	OKTIBBEHA	0.14	157	200	GORD	MS-GW-15128	DEQ
CONNELL, ROBERT ED	SUNFLOWER	0.25	285	1500	MRVA	MS-GW-36057	YMD
GUS PIERALISI AND SONS	WASHINGTON	0.14	158	2000	MRVA	MS-GW-36139	YMD
WHITTEN, DONNY	SUNFLOWER	0.19	216	2000	MRVA	MS-GW-36251	YMD
LIVINGSTON, ERIC AND SHARON	SUNFLOWER	0.24	264	1800	MRVA	MS-GW-36253	YMD
LIVINGSTON, ERIC AND SHARON	SUNFLOWER	0.13	150	2000	MRVA	MS-GW-36254	YMD
MS MUDD	WASHINGTON	0.10	113	3000	MRVA	MS-GW-36282	YMD
McLELLAN, W E, TRUST	TALLAHATCHIE	0.29	327	3000	MRVA	MS-GW-36294	YMD
McLELLAN, W E, TRUST	TALLAHATCHIE	0.31	345	3000	MRVA	MS-GW-36296	YMD
LUSK SR, WILLIAM	SUNFLOWER	0.61	684	3000	MRVA	MS-GW-36310	YMD
WAITS AND WESTMORELAND	SUNFLOWER	0.29	330	2000	MRVA	MS-GW-37204	YMD
TACKETT FISH FARMS	SUNFLOWER	0.29	325	3000	MRVA	MS-GW-39079	YMD
TACKETT FISH FARMS	SUNFLOWER	0.33	375	3000	MRVA	MS-GW-39080	YMD

CONNELL, BETTY M	SUNFLOWER	0.25	282	2500	MRVA	MS-GW-39162	YMD
CONNELL IV, ROBERT ED	SUNFLOWER	0.29	330	3000	MRVA	MS-GW-39235	YMD
PREMIERE PARTNERS IV LP	COAHOMA	0.36	402	2500	MRVA	MS-GW-39335	YMD
PREMIERE PARTNERS IV LP	COAHOMA	0.20	219	2500	MRVA	MS-GW-39343	YMD
SHAMROCK FARMS INC	WASHINGTON	0.36	405	2500	MRVA	MS-GW-39369	YMD
ELMWOOD RICE FARMS INC	WASHINGTON	0.21	240	2000	MRVA	MS-GW-39370	YMD
ELMWOOD RICE FARMS INC	WASHINGTON	0.21	240	2500	MRVA	MS-GW-39371	YMD
ELMWOOD RICE FARMS INC	WASHINGTON	0.21	240	2500	MRVA	MS-GW-39372	YMD
ELMWOOD RICE FARMS INC	WASHINGTON	0.21	240	3000	MRVA	MS-GW-39373	YMD
PRITCHETT JR, RAYMOND	WASHINGTON	0.13	150	2250	MRVA	MS-GW-39400	YMD
IAI USA FUND II LLC	BOLIVAR	0.99	1104	3000	MRVA	MS-GW-39401	YMD
HOLLY RIDGE PLANTING COMPANY	WASHINGTON	0.22	248	3000	MRVA	MS-GW-39432	YMD
TOEWS, LINLEY	SUNFLOWER	0.05	56	2000	MRVA	MS-GW-39456	YMD
TAVOLETI BROS	COAHOMA	0.13	150	2500	MRVA	MS-GW-39466	YMD
JAW LAND COMPANY	COAHOMA	0.11	128	1800	MRVA	MS-GW-39472	YMD

SIMMONS JR, HARRY	HUMPHREYS	0.27	300	1500	MRVA	MS-GW-39605	YMD
SIMMONS JR, HARRY	HUMPHREYS	0.42	475	1500	MRVA	MS-GW-39606	YMD
SIMMONS JR, HARRY	HUMPHREYS	0.13	150	1500	MRVA	MS-GW-39607	YMD
SIMMONS JR, HARRY	HUMPHREYS	0.22	250	1500	MRVA	MS-GW-39608	YMD
SIMMONS JR, HARRY	HUMPHREYS	0.22	250	1500	MRVA	MS-GW-39609	YMD
SIMMONS JR, HARRY	HUMPHREYS	0.22	250	1500	MRVA	MS-GW-39610	YMD
SIMMONS JR, HARRY	HUMPHREYS	0.25	275	1500	MRVA	MS-GW-39611	YMD
SIMMONS JR, HARRY	HUMPHREYS	0.19	215	1500	MRVA	MS-GW-39612	YMD
SIMMONS JR, HARRY	HUMPHREYS	0.07	75	1500	MRVA	MS-GW-39613	YMD
THOMAS JR, WILLIAM H	COAHOMA	0.34	384	2500	MRVA	MS-GW-39623	YMD
THOMAS JR, WILLIAM H	COAHOMA	0.33	375	2500	MRVA	MS-GW-39624	YMD
LYONS, EDWARD M	SUNFLOWER	0.32	360	2500	MRVA	MS-GW-39630	YMD
LEROY PLANTATION INC	WASHINGTON	0.43	480	2800	MRVA	MS-GW-39672	YMD
HOLLY RIDGE PLANTING COMPANY	SUNFLOWER	0.04	50	3000	MRVA	MS-GW-39682	YMD
TOEWS, LINLEY R	SUNFLOWER	0.19	210	2000	MRVA	MS-GW-39817	YMD

PHILLIPS BROTHERS LAND LLC	YAZOO	0.34	380	2000	MRVA	MS-GW-41153	YMD
PHILLIPS BROTHERS LAND LLC	YAZOO	0.34	380	2500	MRVA	MS-GW-45254	YMD

OWNER NAME	COUNTY	VOLUME (MGD)	VOLUME (AF/YR)	STORAGE (AF)	RATE (GPM)	SOURCE	PERMIT NUMBER
Surface Water Applications							
WILMOT LAND COMPANY	WASHINGTON	0.27	300		3000	MAIN CANAL OF STEELE BAYOU	MS-SW-03838
LEROY PLANTATION INC	WASHINGTON	0.27	300		2500	RESERVOIR OF BLACK BAYOU	MS-SW-04017
LEROY PLANTATION INC	WASHINGTON	0.27	300		2500	RESERVOIR OF BLACK BAYOU	MS-SW-04018
LEROY PLANTATION INC	WASHINGTON	0.23	258		2500	DITCH OF BLACK BAYOU	MS-SW-04019
LEROY PLANTATION INC	WASHINGTON	0.23	255		2500	DITCH OF BLACK BAYOU	MS-SW-04020
LEROY PLANTATION INC	WASHINGTON	0.30	340		2500	PUZZLE BAYOU	MS-SW-04021
LEROY PLANTATION INC	WASHINGTON	0.21	232		2500	TAILWATER RECOVERY	MS-SW-04022
LEROY PLANTATION INC	WASHINGTON	0.49	548		2500	RESERVOIR OF BLACK BAYOU	MS-SW-04023
LEROY PLANTATION INC	WASHINGTON	0.41	464		2500	RESERVOIR OF BLACK BAYOU	MS-SW-04024
LEROY PLANTATION INC	WASHINGTON	0.16	180		2500	RESERVOIR OF BLACK BAYOU	MS-SW-04025
HOPE SO FARMS	SUNFLOWER	0.05	60		3500	TAILWATER RECOVERY	MS-SW-04026
HOPE SO FARMS	SUNFLOWER	0.03	30		3500	TAILWATER RECOVERY	MS-SW

HOPE SO FARMS	SUNFLOWER	0.12	138		3500	TAILWATER RECOVERY	04027 MS-SW 04028 MS-SW 10261
ADCOX, RUDOLPH	SCOTT			137		TRIBUTARY OF HALEY CREEK	
Surface Water Modifications							
BERRYHILL PLANTING COMPANY	COAHOMA	0.14	160		3000	HOPSON BAYOU	MS-SW 03938
Surface Water Renewals							
NEBLETT, G RIVES	BOLIVAR	0.19	216		1000	HUSHPUCKENA RIVER	MS-SW 01686
SIMPSON, VERNON, DANCY Q TIP TRUST	DESOTO			648		TRIB OF HORN LAKE CRK	MS-SW 02663
LEROY PLANTATION INC	WASHINGTON	0.40	450		3500	BLACK BAYOU	MS-SW 03246
LEROY PLANTATION INC	WASHINGTON	0.16	180		3500	BLACK BAYOU	MS-SW 03247
LEROY PLANTATION INC	WASHINGTON	0.39	435		3500	BLACK BAYOU	MS-SW 03248
SHAMROCK FARMS INC	WASHINGTON	0.16	180		5000	DEER CREEK	MS-SW 03461

OWNER NAME	COUNTY	TYPE	APP NUMBER	SW PERMIT NUMBER	INVENTORY NUMBER	SOURCE
ADCOX, RUDOLPH	SCOTT	NEW	13-016	MS-SW-10261	N/A	TRIBUTARY OF HALEY CREE

OTHER BUSINESS

Roy Furrh stated that there will be an evidentiary hearing at the February 11, 2014, Permit Board meeting concerning the Kentucky-Tennessee Clay Company– Arnold Rooker matter. Hearing Officer Ricky Luke will be present.

Because the March meeting falls within spring break, Roy Furrh suggested the Permit Board move the March meeting to March 18, 2014. On motion by Jamie Crawford and seconded by Jim Lipe, the Permit Board voted to move the regularly scheduled Permit Board meeting from March 11, 2014, to March 18, 2014. The evidentiary hearing on the Meridian POTW matter which Dan Check requested will take place at the March 18, 2014, meeting.

Roy Furrh stated that the MacLand II evidentiary hearing will be held at the April 8, 2014, Permit Board meeting at 9:30 a.m.

Mr. Furrh stated that Statements of Economic Interest should be filed with the Ethics Commission. The Permit Board will have Federal forms to sign at the February 11, 2014, Permit Board meeting.

MEETING ADJOURNED

DATED at Jackson, Mississippi, this the 14th day of January, 2014.

TRUDY D. FISHER
EXECUTIVE DIRECTOR

DENNIS RIECKE,
PERMIT BOARD CHAIRMAN

GLOBE METALLURGICAL

Globe Metallurgical, Inc
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County Road 56
Selma, AL 36703
Phone: 334-872-3491
Fax: 334-874-2098
www.glbsm.com

Mississippi Environmental Quality Permit Board
c/o Trudy D. Fisher
Executive Director, Mississippi Department of Environmental Quality
515 E. Amite Street
Jackson, MS 39201

RECEIVED
FEB 12 2014
Dept. of Environmental Quality

Re: Request for Formal Hearing
PSD Permit No. 2640-00060
Mississippi Silicon, LLC
AI No. 64456

Dear Executive Director Fisher:

Pursuant to Miss. Code § 49-17-29(4)(b) and Miss. Admin. Code § 11-1:4-3, Globe Metallurgical, Inc. ("GMI") hereby requests that the Mississippi Environmental Quality Permit Board ("Permit Board") conduct a formal hearing on PSD Permit No. 2640-00060 (the "Permit"). The Permit Board took action on the issuance of the Permit at the board meeting on January 14, 2014. Pursuant to Miss. Code § 49-17-29(4)(b), this request for formal hearing is timely.

I. Statement of Interest

GMI is an interested party aggrieved by the Permit Board's action on the Permit. The applicant to which the Permit was issued, Mississippi Silicon, LLC, proposes to construct a facility to manufacture and sell silicon metal and silica fume in Tishomingo County, Mississippi (the "Facility"). GMI manufactures and sells silicon metal and silica fume in the same geographic location as Mississippi Silicon. Mississippi Silicon, LLC will be a competitor to GMI. As such, GMI has an interest relating to the project that is the subject of the permit action and may be affected by the disposition of the action.

II. Grounds for Appeal

Pursuant to Miss. Admin. Code § 11-2:2.2.A, the Mississippi Department of Environmental Quality ("MDEQ") lacked authority to issue the Permit because, among other things:

- Mississippi Silicon, LLC did not demonstrate that emissions from construction or operation of the proposed Facility will not cause or contribute to air pollution in excess of a maximum allowable increases for, among other things, particulate matter with aerodynamic diameter less than 2.5μm ("$PM_{2.5}$") and sulfur dioxide ("SO_2");

EXHIBIT "5"

- Mississippi Silicon, LLC did not demonstrate that emissions from construction or operation of the proposed Facility will not cause or contribute to air pollution in excess of any national ambient air quality standards ("NAAQS"), including, without limitation, the one-hour National Ambient Air Quality Standard ("NAAQS") for nitrogen dioxide ("NO_2");

- Mississippi Silicon, LLC did not provide pre-construction ambient air quality monitoring data for, among other things, particulate matter with aerodynamic diameter less than 10μm ("PM_{10}"), $PM_{2.5}$, NO_2 and SO_2; and

- Mississippi Silicon, LLC did not demonstrate that the proposed Facility will be subject to the best available control technology;

all as required by the federal Clean Air Act, 42 U.S.C. § 7470, *et seq.* ("PSD"), and the applicable Mississippi state implementation plan (the "SIP").

GMI expects to identify additional grounds for appeal during the hearing before the Permit Board.

III. Request for Relief

GMI respectfully requests that the Permit Board: (a) schedule a formal hearing at its earliest opportunity; (b) reverse its prior decision to issue the Permit and revoke the same; and (c) remand the matter of Mississippi Silicon, LLC's application for a PSD permit to MDEQ with instructions not to issue the Permit or any other permit unless and until MDEQ and Mississippi Silicon, LLC comply with all applicable requirements under PSD and the SIP.

Please direct any questions, inquiries and notices pertaining to this request to Matt Greene, Corporate Environmental, Health and Safety Manager, Globe Metallurgical, Inc., 2401 Old Montgomery Highway County Road 56, Selma, Alabama 36703 (740) 336-4164.

Respectfully submitted,

Matt Greene
Corporate Environmental, Health & Safety Manager

cc: Roy H. Furrh, Esq.

STATE OF MISSISSIPPI
PHIL BRYANT
GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
TRUDY D. FISHER, EXECUTIVE DIRECTOR

February 18, 2014

Matt Greene
Corporate Environmental, Health & Safety
Globe Metallurgical, Inc.
2401 Old Montgomery Highway County Road 56
Selma, Alabama 36703

Re: Request for Formal Hearing
PSD Permit No. 2640-00060
Mississippi Silicon, LLC AI # 64456
Tishomingo County, Mississippi

Dear Mr. Greene:

In response to your request for an evidentiary hearing, the Mississippi Department of Environmental Quality has reviewed the applicable regulations concerning your request and determined that your request is barred because it was not timely filed. Because staff issued the permit pursuant to its statutory delegated authority, the time period to request a hearing is governed by the Mississippi Environmental Quality Permit Board Delegation of Permitting Authority Regulations found at 11 Miss. Admin. Code Pt. 1, R. 4.3. Pursuant to those regulations, the time period for an aggrieved party to request a formal hearing before the Mississippi Environmental Quality Permit Board "shall be calculated from the date of the Permit Board meeting at which the decision of the Executive Director or his delegate is accepted by the Permit Board."

MDEQ staff issued the permit on November 27, 2013, and the Permit Board accepted issuance at its December 10, 2013, meeting. Globe Metallurgical, Inc. did not request a hearing until February 12, 2014, which is outside the 30 day period to request an evidentiary hearing. The PSD permit issued to Mississippi Silicone, LLC is not subject to the appeals process and is a final permit.

Sincerely,

Trudy D. Fisher
Executive Director

EXHIBIT "6"

cc: John A. Brunini, Esq.
Keith Turner, Esq.

237537

PHYSICAL DOCUMENT

LPS-n237537-v1

CAA COMPLAINT

Author:	Woolner, Rhodora
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Case Name:	
Court:	MS N.D. Miss.; 5th Cir.
Notes:	SCANNED/UNASSIGNED; 16 FRONT STREET LLC AND C. RICHARD COTTON V. MISSISSIPPI SILICON, LLC
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Received Date:	10/15/2014
Urgent:	
Oversize:	
Bound Document:	

MUSGROVE SMITH LAW

ENRD

October 3, 2014

DEPT. OF JUSTICE - ENRD
ENVIRONMENT DIVISION
14 OCT 15 P4:03

VIA U.S. CERTIFIED MAIL, RETURN-RECEIPT REQUESTED

Administrator Gina McCarthy
Environmental Protection Agency
Mail Code 1101A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Re: Complaint in accordance with 42 U.S.C. § 704(c)

Dear Administrator McCarthy:

In accordance with 42 U.S.C. § 704(c), please find enclosed a copy of the Complaint filed on 9/29/14 in the action styled *16 Front Street LLC and C. Richard Cotton v. Mississippi Silicon, LLC*, No. 1:14-cv-183-SA-DAS, in the United States District Court, Northern District of Mississippi, Aberdeen Division.

By copy of this letter, I am forwarding the same to Attorney General Eric Holder. In addition, I am providing a courtesy copy to Gary Rikard, Executive Director of the Mississippi Department of Environmental Quality.

If you have any questions about this or anything else, please do not hesitate to contact me.

Sincerely,

MUSGROVE/SMITH LAW, PLLC

Ronnie Musgrove

cc: Attorney General Eric Holder (VIA U.S. CERTIFIED MAIL, RETURN- RECEIPT REQUESTED);
Executive Director Gary Rikard (VIA U.S. CERTIFIED MAIL, RETURN-RECEIPT REQUESTED)

Enclosure

601.852.1696 (office)
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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF MISSISSIPPI
ABERDEEN DIVISION

16 FRONT STREET LLC, and C. RICHARD COTTON, Plaintiffs, v. MISSISSIPPI SILICON, LLC, Defendant.	Civil Action No. 1:14CV183-SA-DAS

COMPLAINT

This is a Citizen Suit under the Clean Air Act, 42 U.S.C. §7401 *et seq.* *See* 42 U.S. Code § 7604(a)(3). Plaintiffs 16 Front Street LLC ("16 Front Street") and C. Richard Cotton (collectively, "Plaintiffs"), as and for their complaint for injunctive relief and civil penalties against defendant Mississippi Silicon, LLC ("MS Silicon"), state:

I.
Parties

1. 16 Front Street is a Delaware limited liability company. 16 Front Street owns real property and improvements thereon in Burnsville, Tishomingo County, Mississippi.

2. C. Richard Cotton ("Cotton") is a resident of Saltillo, Lee County, Mississippi. Cotton is a freelance writer and photographer whose work takes him to Tishomingo County and nearby areas on a regular basis. Cotton also regularly visits Pickwick Landing, Pickwick Lake, and Bay Springs Lake for recreation and to enjoy the aesthetic values of these parks, including the clear, clean air, the absence of dust and odors, the clear water and healthy vegetation. *See*

Affidavit of C. Richard Cotton, attached as Exhibit 1 hereto.

3. 16 Front Street and Cotton have standing to bring this lawsuit under 42 U.S.C. § 7604(a)(3). *See, e.g., Sierra Club v. Franklin County Power of Illinois, LLC*, 546 F.3d 918 (7th Cir. 2008) (holding that plaintiff had associational standing to challenge construction without a PSD permit where individual member visited lake every other year to enjoy its natural beauty and clean environment, and alleged that she would stop visiting the lake if emissions from the proposed plant at issue diminished her aesthetic enjoyment of the lake).

4. On information and belief, MS Silicon is an Ohio limited liability company with a principal place of business in Burnsville, Tishomingo County, Mississippi.

II.
Jurisdiction and Venue

5. In this Citizens Suit, Plaintiffs seek to enjoin MS Silicon from continuing to construct a new major emitting facility without a permit required under the prevention of significant deterioration provisions of the Clean Air Act, 42 U.S.C. § 7470, *et seq.* ("PSD") and federally enforceable provisions of the Mississippi state implementation plan (the "SIP").

6. The Court has jurisdiction, under 42 U.S.C. § 7604(a)(3), over Plaintiffs' claim that MS Silicon is constructing a new major emitting facility without a permit required under PSD. *See Citizens for Pennsylvania's Future v. Ultra Resources, Inc.*, 898 F. Supp. 2d 741, 746 (M.D. Pa. 2012) (citing *Weiler v. Chatham Forest Prod., Inc.*, 393 F.3d 532 (2d Cir. 2004)) (holding district court has jurisdiction under § 7604(a)(3) where construction is authorized by a permit that is not a PSD permit).

7. 42 U.S.C. § 7604(b)(1) does not require service of any notice before filing claims

under 42 U.S.C. § 7604(a)(3).

8. The subject air pollution source is a planned silicon metal manufacturing plant that MS Silicon is presently constructing in Burnsville, Tishomingo County, Mississippi (the "Plant"). Venue is proper in the Northern District of Mississippi pursuant to 28 U.S.C. § 1391(b)(2).

9. If built as planned, emissions of air pollutants from the Plant will adversely affect air quality in Burnsville and surrounding areas, including but not limited to Pickwick Landing Dam, Pickwick Lake and Bay Springs Lake.

III.
Background

10. The Clean Air Act ("CAA") prohibits construction of a new major source of air pollutants unless a permit has been issued "in accordance with this part [part C, chapter 1 of the CAA - *i.e.*, PSD]." 42 U.S.C. § 7475(a)(1).

11. At all relevant times, the Mississippi Department of Environmental Quality, an executive agency of the State of Mississippi ("MDEQ"), was authorized by federal law to issue permits to new major sources of air pollutants in Mississippi pursuant to regulations APC-S-2 (2005) and APC-S-5 (2011). *See* 40 C.F.R. Part 52, Subpart Z (2013).

12. APC-S-5 incorporates by reference the provisions of 40 C.F.R. § 51.166(q) and 40 C.F.R. § 52.21, as amended Nov. 4, 2011, except (as relevant here) § 52.21(q), both with minor wording changes to reflect the fact that MDEQ, and not the U.S. Environmental Protection Agency ("EPA"), is the permitting authority and charged, *inter alia,* with responsibility for strict observance of the public participation procedures of the CAA.

13. Under PSD, a new "major emitting facility" or "major source of air pollutants" is any new stationary source that has the potential to emit more than 250 tons per year of any regulated new source review ("NSR") pollutant, including sulfur dioxide ("SO2"), nitrogen oxides ("NOx"), particulate matter ("PM"), volatile organic compounds ("VOC") and carbon monoxide ("CO"). 42 U.S.C . § 7479; 40 C.F.R. § 52.21(b)(1).

14. Each proposed emission unit at a new major emitting facility must be expressly authorized in a permit issued in accordance with PSD, including emission limitations representing continuous emission reductions based on the best available control technology ("BACT") applicable to that emissions unit. 42 U.S.C. §§ 7475(a)(4), 7479(3) and 7601(k); 40 C.F.R. §§ 52.21(b) and (j).

15. One of Congress' declared purposes in enacting PSD was "to assure that any decision to permit increased air pollution in any area to which this section [PSD] applies is made only after careful evaluation of all the consequences of such a decision and *after adequate procedural opportunities for informed public participation in the decisionmaking process*." 42 U.S.C. § 7470(5) (emphasis added).

16. Under the Mississippi SIP, a permit has not been issued in accordance with PSD -- and thus is not a PSD permit -- unless the permit applicant (in this case MS Silicon) and MDEQ (the permitting authority) meet all applicable procedural requirements, including without limitation by taking the following steps:

(a) The applicant demonstrates that emissions from the proposed facility will not cause or contribute to an exceedance of any national ambient air quality standard ("NAAQS") or maximum allowable increase in the area ("PSD increment"). 42 U.S.C. § 7475(a)(3); 40 C.F.R.

§ 52.21(k); APC-S-5.

(b) The proposed permit and all materials submitted by the applicant -- including specifications and drawings, the typical operating schedule, a detailed construction schedule, emission estimates, detailed descriptions of proposed BACT, and air quality impact analyses of the air quality impacts of the source -- are available for public review, in the area in which the source will be located, for not less than 30 days before the permit is issued. 40 C.F.R. §§ 51.160-161 and 166(q); 40 C.F.R. § 52.21(n); APC-S-2; APC-S-5.

(c) MDEQ holds a public hearing before issuing the final permit, with an opportunity at that mandatory hearing for interested persons to make written or oral comments on the air quality impacts of and control technology requirements for the new major source. 42 §§ 7475(a)(2) and 7475(e)(2); 40 C.F.R. § 51.166(q); 40 C.F.R. § 52.21(j)-(k); APC-S-2; APC-S-5.

17. Under the Mississippi SIP, a permit for a new major source of air pollutants must state that the source will meet all the requirements under PSD, including the pre-permit public participation requirements. If the permit does not expressly or impliedly state that the public participation requirements have been met, actual construction of the source may not lawfully commence. 40 C.F.R. § 52.21(a)(2)(iii).

18. Under the Mississippi SIP, construction of a new major source of air pollutants that is not in accordance with the permit application or the terms of the permit is subject to appropriate enforcement action. 40 C.F.R. § 52.21(r)(1).

IV.
Factual Allegations

19. Tishomingo County is an "attainment area" for all regulated NSR pollutants and,

therefore, is subject to the pre-construction permit requirements under PSD.

20. In August 2013, MS Silicon submitted a permit application to MDEQ, seeking issuance of a permit to construct the Plant.

21. On about November 27, 2013, MDEQ issued permit no. 2640-00060 (the "Permit") to MS Silicon, purporting to authorize MS Silicon to construct a new silicon metal manufacturing facility.

22. The Permit authorizes the Plant to emit at least 2,170 tons per year of SO2, 1,906 tons per year of NQx, and 1,444 tons per year of CO.

23. The Plant is a new major emitting facility.

24. Construction of the Plant commenced on or around January 2014.

Public Participation Deficiencies

25. MS Silicon submitted air quality impact modeling to MDEQ in October 2013.

26. On about October 21, 2013, MDEQ made a preliminary determination to issue the Permit to MS Silicon.

27. Notice of the preliminary determination to issue the Permit was published in the Northeast Mississippi Daily Journal on October 24, 2013 (the "Notice").

28. The Notice provides that public comments must be received no later November 22, 2013.

29. Under Mississippi law, the day of publication of the required public notice of the proposed permit does not count toward the minimum 30-day public comment period. Miss. Code § 1-3-67.

30. Contrary to PSD and the SIP, the Notice, on its face, allows the public only 29

days to comment on the proposed permit.

31. MDEQ sent copies of the Notice, MDEQ's PSD air quality analysis project summary, MDEQ's pre-construction review and preliminary determination to issue the Permit, and a draft of the Permit, to the Burnsville Public Library in Burnsville, Mississippi ("Library"), with a letter ("Cover Letter") requesting that the Library make the information available for public review until November 22, 2013. In the Cover Letter, MDEQ instructed the Library that the information could be discarded after November 22, 2013.

32. Although the Cover Letter is dated October 23, 2014, the Cover Letter and its enclosures were not delivered to the Library until October 29, 2013 and were not available for review by members of the public until at least that time.

33. Accordingly, contrary to PSD, the public had at most 24 days in which to review the aforementioned materials.

34. Further, and likewise contrary to PSD, the Library never received, and the public therefore never had the required opportunity to review and comment on, MS Silicon's permit application, MS Silicon's October air quality impact modeling, specifications and drawings, or any other information MS Silicon submitted to MDEQ in support of its permit application.

35. On about November 22, 2013, MS Silicon submitted a supplemental air quality impact modeling report to MDEQ. This modeling report was likewise never delivered to the Library, such that the public never had the required 30-day opportunity to review and comment on the same.

36. Contrary to PSD, MDEQ did not provide the public an opportunity to appear at a public hearing to make oral comments on the air quality impacts of and control technology

requirements for the Plant.

37. Rather, MDEQ issued the Permit without holding a public hearing.

38. The Permit states that it was issued under MDEQ's authority under 40 C.F.R. § 52.20(a) and 52.21, but does not state that it was issued in accordance with the applicable public participation requirements in 40 C.F.R. §§ 51.160-161 and 166(q).

39. In fact, the Permit was not issued in accordance with the public participation requirements in 42 U.S.C. §§ 7475(a) and 7475(e) and the rules in 40 C.F.R. § 51.160-161 and 166(q); therefore, the Permit is not a "PSD permit."

Willful Misconduct

40. MS Silicon and/or MDEQ intentionally abbreviated or omitted the legally required opportunities for public review and comment to prevent objections from Nucor Corporation, which was (and still is) objecting to a PSD permit issued to Big River Steel LLC in Arkansas, an entity which, on information and belief, is an affiliate of MS Silicon -- John D. Correnti, a former Nucor executive, being Chairman of both Big River Steel LLC and MS Silicon. The public-at-large, including Plaintiffs, has born the adverse effect of the steps taken to prevent objections from Nucor Corporation.

41. Contrary to the SIP, MDEQ did not make copies of MS Silicon's air quality impact modeling reports available for public inspection at the Library. Instead, MDEQ provided air quality impact summaries that had been prepared by MDEQ and MS Silicon. These summaries purport to identify the areas in which permitted emissions from the Plant will cause significant impacts. These summaries also purport to demonstrate that permitted emissions from the Plant will not cause or contribute to violations of any NAAQS. In fact, however, these

56. BACT for silicon metal product loading systems typically includes some form of enclosure and/or aspiration to a control device.

57. MS Silicon's permit application does not provide any information regarding emissions or control technologies for cooling towers and silicon metal product loading.

58. MS Silicon's air quality impact analyses do not account for emissions from cooling towers or silicon metal product loading.

59. The Permit does not include emissions limitations or control requirements for cooling towers or silicon metal product loading.

60. The Permit does not authorize MS Silicon to construct cooling towers or silicon metal product loading operations.

Public Interest

61. Plaintiffs will be irreparably harmed if MS Silicon continues to construct the Plant without obtaining a PSD permit pursuant to 42 U.S.C. § 7475 and the SIP. Plaintiffs will have lost statutorily prescribed rights of informed participation in the MDEQ's decision to permit construction of the Plant and thereby permit increased air pollution in the areas in which Plaintiffs reside, work, recreate and/or own property. More effective control technologies that would be technically and economically feasible if included in the preliminary design of the Plant may become unfeasible as a result of the design and layout of the Plaint if constructed as proposed and allowed by the Permit. Plaintiffs will be subjected to unhealthy, harmful and damaging air pollution if the Plant is constructed as proposed and operated as allowed by the Permit.

62. MS Silicon has no legally cognizable interest in continuing to construct the Plant

without a PSD permit.

63. The public interest will be served by enjoining MS Silicon from continuing to construct the Plant until such time as MS Silicon obtains a PSD permit that has been issued in accordance with all the requirements of PSD and the SIP, including the public participation requirements in 40 C.F.R. §§ 51.160-161 and 166(q), from continuing to construct SAF stacks that are not in conformity with its own air quality impact analyses, and from continuing to construct the cooling towers, silicon metal product loading equipment, and other emission units not specifically authorized in any permit.

V.
Claims

Count I: Violations of 42 U.S.C. § 7475(a) and the SIP

64. Plaintiffs incorporate by reference the allegations in paragraphs 1-63 above.

65. MS Silicon is constructing a new major emitting facility without a PSD permit, in violation of 42 U.S.C. § 7475(a)(1) and APC-S-5.

66. MS Silicon is constructing a new major emitting facility that is not in accordance with the materials it submitted to MDEQ and upon which MDEQ made the determination to issue the Permit, in violation of APC-S-5.

67. MS Silicon is constructing emission units that are not authorized by any permit, in violation of 42 U.S.C. § 7475(a)(1) and APC-S-5.

68. Plaintiffs are entitled to an order enjoining MS Silicon from continuing to construct the Plant in violation of 42 U.S.C. § 7475 and APC-S-5.

VI.
Prayer for Relief

Plaintiffs respectfully request the Court to enter judgment for Plaintiffs and against MS Silicon, and enter an order:

1) enjoining MS Silicon from continuing to construct any part of the Plant until such time as MS Silicon obtains a pre-construction permit, for all sources of emissions of regulated NSR pollutants, issued in accordance with 42 U.S.C. § 7475 and the SIP, requiring in particular:

   (a) a full 30-day opportunity for the public to review and comment on: the air quality impacts of permitted emissions from the Plant, considering actual stack parameters and all emission units at the Plant; control technology determinations; and other appropriate considerations;

   (b) a full 30-day opportunity for the public to review the application, air quality impact modeling, drawings and specification, and any other information submitted by MS Silicon in support of the permit, at the Burnsville Library; and

   (c) a public hearing to provide an opportunity for the public to appear and make oral or written comments.

2) assessing civil penalties against MS Silicon pursuant to 42 U.S.C. §§ 7413(d) and 7604;

3) awarding Plaintiffs their costs and fees (including reasonable attorney and expert witness fees) pursuant to 42 U.S.C. § 7604; and

4) awarding Plaintiffs all other just and equitable relief.

Respectfully submitted,

s/ Ronnie Musgrove
RONNIE MUSGROVE (MSB #3698)
ATTORNEY FOR PLAINTIFFS

OF COUNSEL:

MUSGROVE/SMITH LAW
1635 Lelia Drive, Suite 104 (39216)
Post Office Box 4670
Jackson, MS 39296
Telephone: 601-852-1696
Facsimile: 601-852-1714

Affidavit of C. Richard Cotton

State of Mississippi
County of Lee

Personally appeared before me, public notary for the above jurisdiction, C. RICHARD COTTON, who being by me first duly sworn, states on oath the following:

1. My name is C. Richard Cotton. I am over the age of 18 and otherwise fully competent. I make this affidavit based upon my own personal, first-hand knowledge.

2. I am currently 62 years old. I currently live in Lee County, Mississippi, and have resided there for 12 years at the following address: 243 County Road 783, Saltillo, Lee County, Mississippi 38866.

3. I currently own the property where my residence is located.

4. I own two houses on the property; mother resides in the second one next door to my home.

5. I have additional family, including stepchildren and grandchildren, who live in Lee County, Mississippi.

6. I am currently employed as a freelance writer, photographer, and editor. I work out of my home in Lee County, Mississippi, on a regular basis. I travel through Lee County, Mississippi, and other surrounding counties on a regular basis because of work, including: Prentiss County, Mississippi; Alcorn County, Mississippi; and Tishomingo County, Mississippi.

7. I am currently active in the Lee County Democratic Committee and have been a member of it for approximately three years. For approximately one year, I have held the position of vice chairman. The Lee County Democratic Committee meets monthly in Lee County in Tupelo, Mississippi.

8. I live approximately 40 miles from Burnsville, Mississippi.

9. I travel to Baldwyn, Prentiss County, Mississippi, in order to visit my stepdaughter, her two children, and my son-in-law approximately three times monthly.

10. Approximately every two weeks, I travel with my girlfriend to visit a grocery store in Baldwyn, Mississippi, and a restaurant in Marietta, Mississippi.

11. I travel through Alcorn County, Mississippi, approximately twice monthly. I typically travel through Alcorn County, Mississippi, on these occasions on my way to see my daughter in Memphis, Tennessee. I also travel through Alcorn County, Mississippi, on these occasions because of work. On these occasions, I typically travel on U.S. Highway 45 and U.S. Highway 72.

12. I travel to Tishomingo County, Mississippi, approximately three timesmonthly. More specifically, I travel there approximately once monthly because of work. In addition, I travel there approximately twice monthly with my girlfriend to visit a convenience store in Belmont, Mississippi.

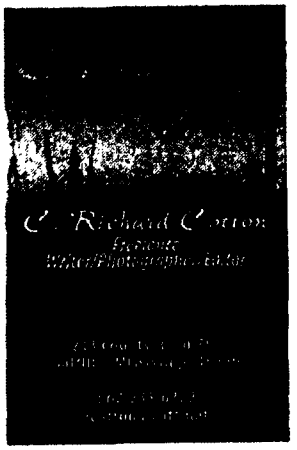
13. Approximately every two weeks, I travel to Tishomingo County, Mississippi, with my girlfriend to visit a convenience store in Belmont, Mississippi.

14. I travel to various locations at Pickwick Lake approximately fives times yearly for recreational purposes. For example, on one or more of these occasions, I travel to Pickwick Lake Dam and Pickwick Landing State Park in Tennessee. Pickwick Landing is approximately one hour away from my residence in Lee County, Mississippi.

15. While at Pickwick Lake on these occasions, I enjoy various activities, including traveling across the dam to look at the scenery; watching fishermen; and visiting the beach.I have also visited Shiloh National Military Park in Tennessee.

16. I have also traveled to Pickwick Lake in Tishomingo County, Mississippi, for work, including gathering material for a story and taking photographs.

17. For example, the following "Graphic 1" is a true and correct copy of my current business card. "Graphic 1" reflects a true and correct copy of a photograph I took at Pickwick Lake in Tishomingo County, Mississippi. I have received awards and other accolades as a result of "Graphic 1." I took, and use, this photograph because of the aesthetic value of the scenery at this location, including clean air and healthy vegetation.



Graphic 1: Photograph Taken at Pickwick Landing in Tishomingo County, Mississippi

18. I travel to Bay Springs in Tishomingo County, Mississippi, and Prentiss County, Mississippi, approximately six times annually. I typically travel to Bay Springs, Mississippi, on these occasions to visit the lake.

19. My girlfriend typically accompanies me to Bay Springs, Mississippi, on these occasions.My grandchildren will sometimes accompany me to Bay Springs, Mississippi, on these occasions.

20. I have been visiting the lake in Bay Springs, Mississippi, on occasions such as the previous for more than approximately 20 years.

21. While in Bay Springs, Mississippi, on these occasions, I typically engage in various recreational activities, including having a picnic and watching my grandchildren swim at Old Bridge Beach or Piney Grove Beach.

22. I usually travel to Burnsville, Mississippi, annually in October to attend the "Trash & Treasures Tenn-Tom Yard Sale." I have attended the event annually for the last four years. I have also written stories on the event in Burnsville, Mississippi.

23. I travel to Itawamba County, Mississippi, approximately once monthly in order to visit my girlfriend's son, who resides there. On these occasions, I typically travel on Twenty Mile Bottom Road in Itawamba County, Mississippi.

24. I understand that emissions of air pollutants from the Mississippi Silicon, LLC, silicon manufacturing plant—including sulfur dioxide, nitrogen oxides, particulate matter, and hazardous air pollutants—will adversely impact air quality in Lee County, Mississippi; Prentiss County, Mississippi; Alcorn County, Mississippi; Tishomingo County, Mississippi; and Itawamba County, Mississippi.

25. For the reasons stated above, emissions of air pollutants from the Mississippi Silicon, LLC, silicon manufacturing plant will adversely impact my health, quality of life, property values, and recreational activities.

26. Air quality has an impact on my decisions to travel to Pickwick Lake and Bay Springs. One reason I have traveled to these locations in the past rather than others is because of the aesthetic values at Pickwick Lake and Bay Springs, including clear, clean air, clean water, healthy vegetation and the absence of dust and odors.

27. Emissions from Mississippi Silicon, LLC, which will cause odors, dust, decreased visibility, and negative effects on vegetation would impact my decision to travel to these locations in the future.

28. Emissions from Mississippi Silicon, LLC, whichwill adversely affect water quality, fishing, and aesthetics at these locations would impact my decision to travel to these locations in the future.

29. Air quality also has an impact on my decision to travel to Burnsville, Mississippi, annually to attend the "Trash & Treasures Tenn-Tom Yard Sale." Emissions from Mississippi Silicon, LLC, whichwill adversely affect air quality at this location would impact my decision to travel to it in the future.

30. I am concerned about potential health effects when I travel to Tishomingo County, Mississippi, for work and for recreational purposes if Mississippi Silicion, LLC, emits air pollution in excess of significant levels established by the Environmental Protection Agency.

31. I am concerned about potential health effects when I travel to Tishomingo County, Mississippi, for work and for recreational purposes if Mississippi

Silicion, LLC, emits air pollution in that causes or contributes to a level in excess of a national ambient air quality standard.

32. I am concerned that the construction plan for the Mississippi Silicion, LLC, silicon manufacturing plant does not include a maximum achievable control technology requirements for emissions of hazardous air pollutants such as hydrogen chloride, and I am also concerned about the plant's potential effects on my health when I travel to Tishomingo County, Mississippi.

33. I intend to continue to visit Tishomingo County, Mississippi, for work and for recreation unless emissions from Mississippi Silicon, LLC, have an adverse impact on air quality and aesthetic values.

C. Richard Cotton

Sworn to and subscribed before me this 22 day of September, 2014.

Notary Public

STATE OF MISSISSIPPI
WANDA GRIMES
ID No 8392
NOTARY PUBLIC
Comm Expires June 21, 2018
ITAWAMBA COUNTY

My Commission Expires: June 21, 2018

JS 44 (Rev. 12/12)

CIVIL COVER SHEET

1:14cv183-SA-DAS

The JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. *(SEE INSTRUCTIONS ON NEXT PAGE OF THIS FORM.)*

I. (a) PLAINTIFFS
16 FRONT STREET LLC, and
C. RICHARD COTTON

DEFENDANTS
MISSISSIPPI SILICON, LLC

(b) County of Residence of First Listed Plaintiff Tishomingo, MS
(EXCEPT IN U.S. PLAINTIFF CASES)

County of Residence of First Listed Defendant Tishomingo, MS
(IN U.S. PLAINTIFF CASES ONLY)

NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE TRACT OF LAND INVOLVED.

(c) Attorneys *(Firm Name, Address, and Telephone Number)*
Ronnie Musgrove
Musgrove Smith Law Office
1635 Lelia Drive, Ste 104, Jackson, MS 39216

Attorneys *(If Known)*

II. BASIS OF JURISDICTION *(Place an "X" in One Box Only)*

- ☐ 1 U.S. Government Plaintiff
- ☒ 3 Federal Question *(U.S. Government Not a Party)*
- ☐ 2 U.S. Government Defendant
- ☐ 4 Diversity *(Indicate Citizenship of Parties in Item III)*

III. CITIZENSHIP OF PRINCIPAL PARTIES *(Place an "X" in One Box for Plaintiff and One Box for Defendant) (For Diversity Cases Only)*

	PTF	DEF		PTF	DEF
Citizen of This State	☒ 1	☐ 1	Incorporated *or* Principal Place of Business In This State	☐ 4	☒ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated *and* Principal Place of Business In Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. NATURE OF SUIT *(Place an "X" in One Box Only)*

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loans (Excludes Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability
- ☐ 196 Franchise

PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury
- ☐ 362 Personal Injury - Medical Malpractice

PERSONAL INJURY
- ☐ 365 Personal Injury - Product Liability
- ☐ 367 Health Care/ Pharmaceutical Personal Injury Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

CIVIL RIGHTS
- ☐ 440 Other Civil Rights
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/ Accommodations
- ☐ 445 Amer. w/Disabilities - Employment
- ☐ 446 Amer. w/Disabilities - Other
- ☐ 448 Education

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Habeas Corpus:
- ☐ 463 Alien Detainee
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- ☐ 530 General
- ☐ 535 Death Penalty

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- ☐ 540 Mandamus & Other
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- ☐ 625 Drug Related Seizure of Property 21 USC 881
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- ☐ 710 Fair Labor Standards Act
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- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lung (923)
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- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

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- ☐ 871 IRS—Third Party 26 USC 7609

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- ☐ 400 State Reapportionment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 480 Consumer Credit
- ☐ 490 Cable/Sat TV
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 890 Other Statutory Actions
- ☐ 891 Agricultural Acts
- ☒ 893 Environmental Matters
- ☐ 895 Freedom of Information Act
- ☐ 896 Arbitration
- ☐ 899 Administrative Procedure Act/Review or Appeal of Agency Decision
- ☐ 950 Constitutionality of State Statutes

V. ORIGIN *(Place an "X" in One Box Only)*

- ☒ 1 Original Proceeding
- ☐ 2 Removed from State Court
- ☐ 3 Remanded from Appellate Court
- ☐ 4 Reinstated or Reopened
- ☐ 5 Transferred from Another District *(specify)*
- ☐ 6 Multidistrict Litigation

VI. CAUSE OF ACTION

Cite the U.S. Civil Statute under which you are filing *(Do not cite jurisdictional statutes unless diversity)*:
42 U.S.C. 7604(a)(3)

Brief description of cause:
Construction of major source without a required permit issued in accordance with 42 USC 7470, et seq.

VII. REQUESTED IN COMPLAINT:

☐ CHECK IF THIS IS A CLASS ACTION UNDER RULE 23, F.R.Cv.P.

DEMAND $ Injunction & Civil Penalties

CHECK YES only if demanded in complaint:
JURY DEMAND: ☐ Yes ☒ No

VIII. RELATED CASE(S) IF ANY *(See instructions)*:

JUDGE _____ DOCKET NUMBER _____

DATE
09/29/2014

SIGNATURE OF ATTORNEY OF RECORD
s/Ronnie Musgrove

FOR OFFICE USE ONLY

RECEIPT # _____ AMOUNT $400 APPLYING IFP _____ JUDGE SA MAG. JUDGE DAS

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The Honorable Eric Holder
Attorney General
U.S. Department of Justice
950 Pennsylvania Avenue, N.W.
Washington, D.C. 20530-0001

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VIA ELECTRONIC MAIL

April 1, 2014

Ms. Jeaneanne M. Gettle
Deputy Director
Air, Pesticides, and Toxics Management Division
United States Environmental Protection Agency, Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303
Gettle.jeaneanne@epa.gov

Re: Mississippi Silicon, LLC PSD Permit
(Tishomingo County, Mississippi, Air Ref. No. 2640-00060)

Dear Ms. Gettle:

Thank you again for the opportunity to present to the United States Environmental Protection Agency ("EPA" or "the Agency") our concerns regarding the Mississippi Silicon, LLC ("MS Si") prevention of significant deterioration permit ("PSD Permit"), which authorizes the construction of a greenfield silicon smelting plant near Burnsville, Mississippi (the "MS Si Facility"). As elaborated below, the Mississippi Department of Environmental Quality ("MDEQ") issued the Permit prematurely, in violation of the Clean Air Act ("CAA" or "the Act"). As discussed during our recent teleconference, the administrative record reflects that MDEQ fast-tracked the MS Si PSD Permit by releasing the preliminary determination and air quality analysis for the permit within just two months of receiving the permit application and prior to the permit applicant submitting final air quality impact modeling results.

As a direct result, MDEQ materially compromised federal public participation requirements and issued an invalid PSD permit that fails to set appropriate emission and production limits due, among other things, to reliance on improperly calculated emission estimates set forth in the permit application. Consequently, analysis of air quality impacts from operation of the proposed MS Si Facility including compliance with National Ambient Air Quality Standards ("NAAQS") and air quality related values ("AQRVs") in the Sipsey Wilderness Area in Bankhead National Forest in northern Alabama was inadequate. Moreover, the Permit: (i) fails to identify all applicable emission limitations including National Emission Standards for Hazardous Air Pollutants ("NESHAPs") due to gross underestimation of hazardous air pollutants ("HAPs") emissions, and (ii) improperly assesses emission control technologies due, *inter alia*, to erroneous potential to emit ("PTE") calculations and failure to conduct a

proper top-down best available control technology ("BACT") analysis.

The MS Si PSD Permit deficiencies go to the core of the integrity of the PSD and NESHAP programs and likely will result in NAAQS non-compliance and exceedance of AQRVs in the Sipsey Wilderness Area. There may also be significant impacts at the Mingo Wilderness Area in southeastern Missouri. Accordingly, Globe Metallurgical, Inc. ("GMI") respectfully requests that EPA exercise its responsibility as the "national steward of environmental enforcement"[1] of the CAA and direct MDEQ to reopen the public comment period to address the MS Si PSD Permit deficiencies. Alternatively, we petition EPA to overfile by initiating enforcement actions against the permittee and/or MDEQ to enjoin construction of the proposed MS Si Facility until a valid PSD permit is obtained consistent with relevant EPA guidance including, *inter alia*, Alushin & Seitz, "Procedures for EPA to Address Deficient New Source Permits Under the Clean Air Act" (July 15, 1988) (hereinafter "Procedures for EPA to Address Deficient NSR Permits Guidance").[2]

MS Si PSD PERMIT DEFICIENCIES

The MS Si PSD Permit issued by MDEQ contains significant defects under all eight of the factors for determining whether a PSD permit is deficient as identified in the Procedures for EPA to Address Deficient NSR Permits Guidance at 2, which provides:

> [A]lthough not an exhaustive list, **any one of the following factors will normally be sufficient for EPA to find a permit "deficient" and consider enforcement action:**
>
> 1. BACT determination not using the "top-down" approach.
> 2. BACT determination not based on a reasoned analysis.
> 3. No consideration of unregulated toxic pollutants in BACT determination.
> 4. Public notice problems – no public notice & comment period or deficiencies in the public notice.
> 5. Inadequate air quality modeling demonstrations.
> 6. Inadequate air quality analysis or impact analysis.
> 7. Unenforceable permit conditions.
> 8. For sources that impact Class I areas, inadequate notification of Federal Land Manager or inadequate

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[1] *See* EPA, Office of Inspector General, "EPA Must Improve Oversight of State Enforcement," Report 12-P-0113 at 11 (December 9, 2011) (http://www.epa.gov/oig/reports/2012/20111209-12-P-0113.pdf).
[2] http://www.epa.gov/ttn/nsr/psd1/p10_33.html.

> consideration of impacts on air quality related values of Class I areas. (Emphasis supplied.).

While "**any one of these factors is sufficient,**" we demonstrate below that the MS Si PSD Permit deficiencies implicate **every** factor identified in the EPA Guidance. Indeed, many of the permit deficiencies we identify were raised by EPA Region 4 in its written correspondence to MDEQ[3] in the permitting process, but neither the MDEQ nor the applicant addressed them adequately in responses to EPA or in the final MS Si PSD Permit, as issued. Given these circumstances, EPA's credibility, the integrity and fundamental goals of the CAA, as well as public health and the environment, are all at stake here.

A. The Top-Down Approach Was Not Properly Used In The MS Si PSD Permit BACT Analysis

Simply stated, the MS Si PSD Permit BACT analysis for the submerged arc furnaces ("SAFs") the applicant proposes to operate is flawed at every step. Properly establishing BACT is one of the most important aspects of the PSD Program; a top-down BACT analysis not only establishes the emission limitations for PSD pollutants at the facility, it also sets the bar for future BACT determinations nationwide. Accordingly, sections 160(5) and 165(a)(2) of the CAA require that the public be provided a meaningful opportunity to participate in the PSD process, including selection of BACT. We submit that the case for EPA action to protect the integrity of the PSD program is at its strongest where, as here, the permitting agency issues a permit based on profoundly flawed BACT analysis, especially after materially compromising public participation.[4]

Set forth below is a discussion of just some of the more egregious errors found in the top-down BACT analysis for the SAFs at the proposed MS Si Facility. The BACT determination for other equipment at the MS Si Facility also may be substantially flawed and other flaws may exist in the BACT analysis for the SAFs as well. This review, however, focuses on a few of the most significant errors rather than presenting a comprehensive analysis of all top-down BACT analysis deficiencies. In this regard, we stress that EPA itself has identified numerous deficiencies in the MS Si PSD Permit BACT analysis for the PSD pollutants, which, in our

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[3] *See* E-mail correspondence from Stanley Krivo (EPA Region 4) to Jacqueline Evans (MDEQ), "Air Quality Impact Assessment Review Comments – Mississippi Silicon," (September 10, 2013); Letter from Heather Ceron (EPA Region 4) to Harry M. Wilson III (MDEQ), (EPA written comments regarding MS Si PSD Preliminary Determination) (November 14, 2013); and Letter from Heather Ceron (EPA Region 4) to Harry M. Wilson III (MDEQ), (EPA supplemental written comments regarding MS Si PSD Preliminary Determination) (November 21, 2013).

[4] The defects in public participation are described at section D, *infra*.

opinion, remain largely unaddressed, including energy recovery of waste heat to minimize greenhouse gas ("GHG") releases, among others.

1. Step 1: Identify Available Control Technologies

Material flaws in the MS Si BACT analysis for the SAFs begin with Step 1, where applicable control technologies used on SAFs in Europe and on similar electric arc furnaces ("EAFs") in the United States were improperly excluded from consideration. The MS Si PSD Permit Application at 4-3 expressly and inappropriately limits identification of available control technologies to only those technologies "in commercial use in the United States at the time the analysis." In contrast, EPA guidance is clear that the obligation to identify available technologies in Step 1 of the BACT analysis includes technologies in commercial use for the same equipment – SAFs – in Europe as well as similar equipment – EAFs – in the United States and Europe.

> **Available control options are those air pollution control technologies or techniques with a practical potential for application to the emissions unit and the regulated pollutant under evaluation.** Air pollution control technologies and techniques include the application of production process or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant. **This includes technologies employed outside of the United States.** As discussed later, in some circumstances inherently lower-polluting processes are appropriate for consideration as available control alternatives. **The control alternatives should include not only existing controls for the source category in question, but also (through technology transfer) controls applied to similar source categories and gas streams, and innovative control technologies.** (Emphasis supplied.).[5]

Examples of applicable control technologies improperly excluded from consideration in the MS Si PSD Permit BACT analysis include, *inter alia*, (1) the wet electrostatic precipitator ("ESP") as an available technology to control condensable particulate matter from the combustion of coal and wood, (2) post-combustion chambers for thermal gas purification from

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[5] EPA, New Source Review Workshop Manual (Draft 1990) at B-5 (hereinafter "NSR Workshop Manual"), available at: http://www.epa.gov/ttn/nsr/gen/wkshpman.pdf.

the MS Si SAFs, and (3) waste heat recovery to minimize the increase in GHG associated with the primary and secondary emissions resulting from the project. Wet ESPs are considered BACT for coal combustion in the United States to control condensable particulate matter. Heat recovery, used in a wide variety of applications, is an available technology that would reduce GHG emissions, and should be considered as emission control technology for the MS Si SAFs and other combustion equipment.

The obligation to cast a wide net in evaluating available control technologies by "initially identify[ing] all control options with potential application to the emissions unit under review"[6] is particularly vital in the instant circumstance because the SAF is not a common emissions unit with a history of BACT determinations in the United States. As the setting of BACT for SAFs takes on particular significance in setting future BACT precedent for SAFs, the instant situation presents compelling reason for EPA to direct MDEQ to reopen the MS Si PSD permit public comment period or overfile against MDEQ and/or MS Si to enjoin the Permit.

2. Step 2: Eliminate Technically Infeasible Options

Another significant failure of the MS Si BACT analysis is the repeated elimination of potential control technologies in Step 2 as technically infeasible based on economic considerations or arguments. Such economic considerations must be determined relative to the costs of controls other industries have borne under Step 4 to ensure a proper top-down BACT analysis, not at Step 2 of the top-down BACT analysis. The NSR Workshop Manual at B.19 is clear:

> **Where the resolution of technical difficulties is a matter of cost, the applicant should consider the technology as technically feasible**. The economic feasibility of a control alternative is reviewed in the economic impacts portion of the BACT selection process. (Emphasis supplied.).

Improper reliance on economic factors to support technical feasibility determinations in Step 2 within the MS Si PSD Permit BACT analysis are found in the SO_2 BACT analysis for the SAFs where the cost of low-sulfur coal compared to higher sulfur coal is cited in determining technical feasibility. For example, the MS Si PSD Permit SO_2 BACT analysis inappropriately references higher costs for low-sulfur coal and MS Si consideration of cost "to utilize the lowest cost-effective available coal sources" in applying this SO_2 control technology:

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[6] *Id.* at B-5 to B-7.

> Coal – The Department of Energy estimates that the use of the lowest sulfur coal can result in up to 85 percent lower SO_2 emissions than the use of many types of higher sulfur coal. In the U.S., coal from eastern states including Ohio, Pennsylvania, and West Virginia has higher sulfur content, accounting for 3 to 10 percent of the coal's weight; coal from western states such as Wyoming, Montana, Utah, and Colorado can have sulfur contents that make up less than 1 percent of its weight. **However, low-sulfur coal is significantly more expensive than higher sulfur coal, and often incurs additional transportation costs. MS Silicon will work to utilize the lowest cost effective, available coal source. The success of the plant is to produce a high quality silicon product that is cost competitive within the industry**. MS Silicon will be utilizing a best available SAF and supporting equipment to:
>
> 1) Produce a **cost competitive** product;
> 2) Minimizes emissions of regulated air pollutants; and
> 3) Utilize good combustion practices and operating equipment to minimize the plant's energy/GHG footprint. (Emphasis supplied.).[7]

Moreover, allowing variation of SO_2 concentrations at the MS Si Facility by effectively granting the permittee the discretion and operational flexibility to utilize higher-sulfur coal sources based on cost considerations in the MS Si PSD Permit skews evaluation of technical feasibility because variation in SO_2 concentrations impact control efficiencies and reagent costs as well as analysis of the cost-effectiveness of available technologies. As a result, spray dryer adsorption ("SDA") systems and the dry sorbent injection ("DSI") process were both improperly eliminated at Step 2 based on technical infeasibility determinations based on variability in SO_2 concentrations during the SAFs cycle.

The variation in SO_2 concentrations set forth in the MS Si PSD Permit Application at 4-78 relate to the amount of reagent that would need to be added to control the SO_2. There is no technical basis for varying SO_2 concentration making the technologies unworkable in this application and injection of reagents in front of the proposed baghouse is clearly technically achievable. A failure to completely and accurately predict SO_2 concentrations and adjust reagent addition rates could lead to lower than optimal control and higher than optimal reagent usage

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[7] MS Si PSD Permit Application at § 4-78.

rates to achieve the desired level of control. These considerations, however, are clearly economic and environmental impacts that must be evaluated in Step 4 of the top-down BACT process; elimination of these technologies at Step 2 is inappropriate.

> SDA – The SDA process would not have many of the potential operating problems associated with the wet scrubbing systems. **The SO_2 concentration will vary widely over the SAFs cycle. Thus, SDA dry scrubbing option is considered technically infeasible** for this application and will not be considered any further in this BACT analysis.
>
> DSI – The dry sorbent injection process would not have many of the potential operating problems associated with the wet scrubbing systems. **The SO_2 concentration will vary widely over the SAFs cycle. The injection dose of sorbent materials would be hard to control in order to match variability in SO_2 concentrations**. Similar control systems are fraught with chronic operational problems with the sensors requiring frequent maintenance and calibration. (Emphasis supplied.).[8]

Such circular logic employed to eliminate technologies at Step 2 based on economic considerations in the MS Si PSD Permit BACT analysis compromised the integrity of the MS Si PSD Permit SO_2 BACT analysis. Finally, the discussion of economics for lower-sulfur materials in the MS Si PSD Permit SO_2 BACT analysis is particularly problematic since use of lower-sulfur materials was, ultimately, the selected technology for control of SO_2 in the MS Si PSD Permit **but only when** the use of low sulfur content material is technically feasible, thus establishing an unenforceable permit condition.

> III.25 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit SO_2 emissions to no more than 52.0 lbs/ton, as determined by a 3-hr rolling average period of Silicon produced, and Utilize Low Sulfur Content Material where technically feasible (BACT for SO_2). (Ref.: PSD Construction Permit issued Issuance Date).

This permit term indicates that the MS Si PSD Permit failed to establish technical feasibility as part of the BACT review since the technical feasibility of utilizing low sulfur

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[8] *Id.*

content material remains an open issue in the Permit. Such a reference to technical feasibility in the MS Si PSD Permit undermines the enforceability of the Permit because it effectively provides that the SO_2 BACT emission limit shall apply -- or not -- at the discretion of the permittee.[9] Finally, SO_2 is also a primary precursor of $PM_{2.5}$; the deficiencies of the BACT analysis for SO_2 as a criteria pollutant also point to deficiencies in the evaluation of BACT for precursors of $PM_{2.5}$ where the MS Si PSD permit failed to evaluate or establish any BACT for precursors of $PM_{2.5}$.[10]

3. Step 3: Rank Remaining Control Technologies by Control Effectiveness

In Step 3 of the top-down BACT analysis, a hierarchical ranking of control determinations for SAFs must be presented. However, the MS Si BACT analysis for the SAFs does not meet this requirement. For example, the MS Si SAFs BACT analysis for $PM_{2.5}$ lists control efficiencies with a baghouse at 99.9%, but then jumps to a BACT level of 0.005 gr/dscf without any substantiation or prior discussion.

MS Si's analysis for condensable $PM_{2.5}$ is not credible either. In the introduction of the BACT analysis set forth in the MS Si PSD Permit Application at 4-19, a review of condensable particulate controls is offered, but no control technologies are presented and control efficiencies for condensable particulate matter are not analyzed. A proper top-down BACT analysis for control of $PM_{2.5}$ emissions from coal and wood combustion at the MS Si SAFs must include consideration of a wet ESP because this control technology has been demonstrated as BACT for coal combustion in the United States[11] and because both wood and coal combustion produce considerable condensable particulate emissions.

Furthermore, the condensable $PM_{2.5}$ emission limitation was not substantiated in Step 3. It appears to be derived from an asserted 99.9% control efficiency for fabric filtration (baghouse) technology but, without question, a baghouse is incapable of providing 99.9% control for condensable particulate matter due to, *inter alia*, the inherent need to maintain fabric filtration devices above temperatures that promote condensation. A value in the 70-75% range is a more reasonable estimate and, thus, fabric filtration technology should not be considered BACT for condensable particulate matter emissions from the MS Si SAFs.[12]

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[9] *See* section F, *infra.*
[10] *See* section B.1, *infra.*
[11] *See* section A.1, *supra.*
[12] *See, e.g.,* Southern Montana Electrical Transmission BACT Analysis, 2009 BACT Hierarchy Table for filterable and condensable particulate matter for coal combustion (http://www.bison-eng.com/docs/020209-PM2-5-BACT-Highwood-Station.pdf).

4. Step 4: Energy, Environmental, and Economic Considerations

Step 4 of the top-down BACT analysis may be avoided only when the highest level of control has been selected as BACT. The MS Si BACT analysis, however, improperly dismissed numerous available technologies in Step 2 under the guise of technical infeasibility, thereby limiting proper consideration of available technologies and compromising review by EPA, Affected States and the public.[13]

5. Step 5: Selecting BACT

MS Si overstepped its bounds or misunderstood its role in the top-down BACT process by selecting BACT in Step 5. The permit authority – in this case, MDEQ – with input from the public, selects BACT, not the permit applicant.

> The most effective control alternative not eliminated in Step 4 is selected as BACT. It is important to note that, regardless of the control level proposed by the applicant as BACT, **the ultimate BACT decision is made by the permit issuing agency after public review**. The applicant's role is primarily to provide information on the various control options and, when it proposes a less stringent control option, provide a detailed rationale and supporting documentation for eliminating the more stringent options. (Emphasis supplied.).[14]

Yet, in the MS Si PSD Permit Application, MS Si repeatedly selects BACT, which MDEQ then apparently rubber-stamped and incorporated into the MS Si PSD Permit and Preliminary Determination. It is thus clear that MDEQ failed to conduct a proper top-down BACT analysis as required by section 165(a)(4) of the Act and EPA regulations set forth at 40 C.F.R. § 52.21(j)(2), which are incorporated by reference at Mississippi Commission on Environmental Quality, Commission Regulation APC-S-5, ¶ 2, "Regulations for the Prevention of Significant Deterioration of Air Quality."

B. The MS Si PSD Permit BACT Determination Was Not Based On Reasoned Analysis

The MS Si PSD BACT Determination is flawed due to reliance on erroneous potential to

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[13] *See* section A.2, *supra.*
[14] NSR Workshop Manual at B-53.

emit ("PTE") calculations for PSD pollutants including SO_2, NO_2, CO, particulate matter (PM), known as PM_{10} and $PM_{2.5}$, and PM condensables. As a result, MS Si PSD BACT Determination was based on inappropriate emission control technology assessments or, in the instance of PM precursors, a complete failure to address condensable $PM_{2.5}$ and precursors of $PM_{2.5}$ in the BACT analysis, as required by EPA.

> How must BACT be implemented for $PM_{2.5}$?
>
> **We are not making any change to our current regulations or policy for implementing BACT requirements at a major source that is subject to the requirements of the PSD program.** Accordingly, if a new major source will emit, or have the potential to emit, a significant amount of a regulated NSR pollutant in an attainment area for that pollutant, the source must apply BACT for each emissions unit that emits the pollutant. In addition, if a physical or operational change at an existing major source will result in a significant emissions increase and a significant net emissions increase of a regulated NSR pollutant in an attainment area for that pollutant, the source must apply BACT to each proposed emissions unit experiencing a net increase in emissions of that pollutant as a result of the physical or operational change in the unit. **Under the $PM_{2.5}$ PSD program, these requirements will apply to direct $PM_{2.5}$ emissions; SO_2 emissions; NO_x emissions, unless a State demonstrates that NO_x is not a significant contributor to ambient $PM_{2.5}$ concentrations in that area; and to VOC if identified by a State as a precursor in the $PM_{2.5}$ attainment area where the source is located.** (Emphasis supplied.).[15]

In addition, the MS Si PSD Permit allows for circumvention of PSD process by basing production limits, PTE calculations, and annual usage limits on operation of four SAFs (which MS Si proposes to build), *but* analysis of air quality impacts is based on operation of only two SAFs at one time. Failure to properly conduct a complete and appropriate top-down BACT analysis in advance of construction of the envisioned four SAF operation clearly undermines the potential to ever obtain appropriate PSD review. Such an approach compromises the integrity of the PSD process by: (i) skewing cost effectiveness analysis in the MS Si PSD Permit BACT determination; (ii) potentially eliminating emission control technologies based on retrofit rather

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[15] 73 Fed. Reg. 28321, 28336 (May 16, 2008).

than greenfield installation feasibility and costs; and (iii) effecting an improper deferral and segmentation of the air quality analysis.

For example, under the MS SI PSD Permit as issued, neither an after-chamber burner nor a wet ESP will be installed as control technology at the MS Si Facility to control emissions despite proven application at similar facilities.[16] Consideration of such technologies in a top-down BACT analysis for the MS Si Facility at a future date (after construction is completed under another PSD permit or review of a Title V permit application) will be skewed, and application of such pollution control technologies potentially excluded based on cost, due to the added expense of retrofitting the proposed facility -- particularly if, as we suspect, space for the equipment is not provided for in the original construction specifications.

1. The MS Si PSD Permit BACT Determination Did Not Include Assessment of PM Precursor Control Technologies

$PM_{2.5}$ emissions are estimated in the MS Si PSD Permit Application to be 73.33 tons per year or "tpy." Permitted PM precursor emissions are greater than 4,000 tpy – the current MS Si PSD Permit allows 1,906.2 tpy of NO_x and 2,170.1 tpy of SO_2. Northeast States for Coordinated Air Use Management ("NESCAUM") issued modeling guidance for permit modeling that applies 3-9 % per hour conversion for SO_2 and 2.5-8% per hour for NO_x emissions, depending on averaging time.[17] Applying the NESCAUM modeling guidelines establishes that these precursor pollutants are transformed into $PM_{2.5}$ in the atmosphere. Consequently, for MS Si Facility emissions, the large amount of uncontrolled precursors present more significant risks to human health and the environment than the filterable particulate matter that MS Si PSD Permit Application considered in the BACT analysis.

As reflected in Table 1, MS Si precursors of $PM_{2.5}$ are likely to dominate the $PM_{2.5}$ impacts, becoming approximately three (3) times more significant than stack emissions approximately one hour downwind from the proposed MS Si Facility. As this is a comparison to annual $PM_{2.5}$ emissions, we use annual conversion rates, which as indicated are 3% and 2.5%:

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[16] European Commission, "Integrated Pollution Prevention and Control: Best Available Techniques Reference Document on the Production of Iron and Steel," (December 2001) (http://eippcb.jrc.ec.europa.eu/reference/BREF/isp_bref_1201.pdf).

[17] Letter from Arthur N. Marin (NESCAUM, Executive Director) to George Bridgers (EPA) re: "Draft Guidance for P.M.$_{2.5}$ Permit Modeling," at 4 (May 30, 2013) (http://www.nescaum.org/documents/nescaum-comments-draft-guidance-pm25-permit-modeling-20130530-final.pdf/).

Table 1 – Importance of Precursor Control to BACT

Pollutant	Emissions Rate tons	Conversion Rate	MW	MW ammonium particle	Change in Mass	$PM_{2.5}$ Contribution tons
NO_x	1906.2	2.5%	46.01	80.05	174.0%	82.9
SO_2	2170.1	3.0%	64.07	132.14	206.2%	134.3
$PM_{2.5}$	73.33					
					sum	217.2

The MS Si PSD Permit BACT analysis, therefore, is flawed due to the failure to identify or evaluate available emission control technologies for PM precursors as required for BACT implementation for $PM_{2.5}$.

2. The MS Si PSD Permit Circumvents PSD Requirements

The MS Si PSD Permit allows for circumvention of PSD requirement by establishing emissions limitations in tpy of pollutants emitted, production limits in tons of silicon metal produced, and annual usage limits on materials such as coal and wood that are representative of four SAF operation, while at the same time evaluating the air quality impacts associated with the proposed MS Si Facility based on operation of only two SAFs. We believe this was done to conceal or "finesse" adverse air quality impacts of four SAF operation as a "band-aid" solution in fast-tracking the MS Si PSD Permit. In this regard, the permit allows production of 84,096 tons of silicon and combustion of 105,120 tons of coal and 212,763 tons of wood per year. These are the annual figures for four furnaces. On its face, therefore, the permit allows MS Si to operate "two furnaces" substantially above the emissions rates modeled in the air quality impacts analyses without violating permit limits. This should not be.

Moreover, the MS Si PSD Permit term III-55 expressly allows for simultaneous use of all four of the planned SAFs in the future, in circumvention of PSD program requirements. Hence, while MS Si PSD Permit term III-54 purports to limit SAF operation to only two SAFs at one time, *viz.*:

> For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is only authorized to operate two (2) out of the four (4) Submerged Arc Furnaces at any given time and shall never operate all four combined Submerged Arc Furnaces at one time. (Ref. PSD Construction issued Issuance Date.)

MS Si PSD Permit term III-55 expressly allows for relaxation of the two SAF operational limit in the future, *viz.*:

> For Emission Point AA-201 (Submerged Arc Furnaces), **the permittee can formally request a modification to this permit to remove the restriction on the number of Submerged Arc Furnaces that can operate at any given time**. To request elimination of this restriction via permit modification, the permittee must submit a demonstration to MDEQ, EPA and the FLM [Federal Land Manager] that operation of 3 or 4 Submerged Arc Furnaces simultaneously would not cause or contribute to violation of the National Ambient Air Quality Standards (NAAQS), or exceed the visibility thresholds or deposition analysis thresholds (DAT) for Sipsey Wilderness or Mingo National Wildlife Refuge (both are federally mandated Class I areas). The applicant will follow EPA's Appendix W requirements and the 2010 Federal Land Manager's Air Quality Related Values Workgroup (FLAG) document for conducting an air quality impact evaluation to Class II and Class I areas, respectively. Operation of 3 or 4 Submerged Arc Furnaces at any time can only occur after a PSD permit modification is issued by MDEQ. (Ref.: PSD Construction Permit Issued November 27, 2013). (Emphasis supplied.).

Thus, while MS Si PSD Permit term III-55 purports to ensure compliance with PSD program requirements, this permit term actually allows the MS Si PSD Permit to be divided into multiple segments. This will effectively circumvent applicable New Source Review ("NSR") review requirements and improperly accelerate the permitting process, thereby compromising the integrity of the PSD program and laying the foundation for sham permitting in violation of the Act.

Sham permitting is a term used throughout EPA guidance to describe a permit that is intended to circumvent applicable NSR permitting requirements including those of the PSD program.[18] It is not a regulatory term; rather, sham permitting is a type of PSD circumvention.

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[18] *See, e.g.*, Memorandum from John B. Rasnic (EPA, Director of the Stationary Source Compliance Division) to George T. Czerniak (EPA Region V, Chief of the Air Enforcement Branch) entitled "Applicability of New Source Review Circumvention to 3M – Maplewood, Minnesota" (June 23, 1993) (hereinafter "EPA Applicability of NSR Circumvention Guidance") (http://www.epa.gov/region7/air/nsr/nsrmemos/maplwood.pdf); Memorandum from

Typically, sham permitting involves splitting a project into multiple permitting activities to avoid applicable NSR requirements.

> Generally in "sham" permitting, a source attempts to expedite construction by securing minor source status through permits containing operational restrictions from which the source intends to free itself shortly after completion of construction and commencement of operation. Such attempts are treated as unlawful circumvention of the preconstruction review requirements.[19]

Most EPA memoranda describe sham permitting as using several minor permit actions to avoid applicable major source NSR requirements. However, sham permitting elements also are found, as in the instant case, where PSD permit review is segmented or deferred to expedite the construction.

> **Permits with conditions that do not reflect a source's planned mode of operation are sham permits, are void *ab initio***, and cannot shield a source from the requirement to undergo preconstruction review. (Emphasis supplied.).[20]

EPA guidance, therefore, is clear that permits with sham operational limits are not allowed by the CAA or federal regulations set forth at 40 C.F.R. § 52.21(r)(4) and the definition of PTE set forth at 40 C.F.R. §§ 52.21(b)(4), 51.165(a)(1)(iii), 51.166(b)(4).

> **The definition of potential to emit enables sources to obtain federally enforceable permits with operational restrictions** as a means of limiting emissions to minor source levels. **However, implicit in the application of these limitations is the**

Terrell E. Hunt (EPA, Associate Enforcement Counsel for the Air Enforcement Division) and John S. Seitz (EPA, Director of the Stationary Source Compliance Division) entitled "Guidance on Limiting Potential to Emit in New Source Permitting" (June 13, 1989) (hereinafter "Guidance on Limiting PTE in NSR Permitting") http://www.epa.gov/airtoxics/pte/june13_89.pdf; and EPA Region 3 Website, "Limiting Potential to Emit (PTE) in New Source Review (NSR) Permitting," (hereinafter "Limiting PTE in NSR Permitting Guidance") http://www.epa.gov/reg3artd/permitting/limitPTEmmo.htm.

[19] EPA Applicability of NSR Circumvention Guidance at 2.

[20] *Id.; see also* Guidance on Limiting PTE in NSR Permitting at 10.

> **understanding that they comport with the true design and intended operation of the project**. (Emphasis supplied.).[21]

In the instant case, the proposed MS Si Facility did undergo preconstruction review; however, that review was improperly narrowed based on a "permit … containing operational restrictions that the source intends to free itself shortly after completion of construction and commencement of operation,"[22] thereby limiting PSD review – including limiting analysis of air quality impacts to simultaneous operation of two of the four planned SAFs – when the MS Si PSD Permit clearly contemplates that all four will be operated simultaneously in the future. Deferring analysis of air quality impacts and BACT determinations to a later date, when expansion of operations at the MS Si Facility from two to four SAFs is clearly contemplated, compromises the PSD review process.

Moreover, the MS Si PSD Permit Application and current PSD Permit fail to properly account for all emissions, making it plain that MDEQ did not conduct an appropriate top-down BACT analysis. Under a proper BACT review, the economics of a two SAF project versus a four SAF project differ substantially. Permit term III-55 effectively sets the stage for limited later review of air quality impacts entailed in moving from two to four SAF operation rather than a full preconstruction review of a greenfield project operating four SAFs.[23] Most troubling of all in light of the highly flawed technical review of the proposed MS Si project, permit term III-55 effectively enshrines the current inadequate PSD determination and fails to set a PTE that "comports with the true design and intended operation of the [MS Si] project."

In addition, under the current MS Si PSD Permit, two SAFs are allowed to produce 84,096 tpy of silicon. Figure 2-4 of the MS Si Permit Application, however, lists the capacity of each SAF as 2.4 tons per hour at typical operation and 2.75 tons per hour at maximum capacity. Using the typical operating capacity of the SAF to estimate annual production results yields an estimated capacity of 21,024 tpy of silicon per SAF. Two SAFs, therefore, are only capable of producing 42,048 tpy of silicon. **Yet the MS Si PSD Permit allows production of 84,096 tpy of silicon.**

Dividing the annual NO_x limit of 1906.2 tons by the stated production capacity of the two SAFs at 42,048 tons per year of silicon shows that the current permit actually allows the MS Si Facility to emit 90.7 tons of NO_x per ton of silicon produced – more than twice the 45 pounds of NO_x per ton of silicon produced set forth in the MS Si PSD Permit. Thus, the current MS Si

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[21] Guidance on Limiting PTE in NSR Permitting at 10; and Limiting PTE in NSR Permitting Guidance.
[22] EPA Applicability of NSR Circumvention Guidance at 2.
[23] *See* section B, *supra*.

PSD permit includes inappropriate operational restrictions that effectively will allow the MS Si Facility to double its production capacity without undergoing PSD review, and which do not reflect the true design and intended operation of the MS Si project – all in contravention of the Act, federal PSD regulations and applicable EPA guidance.[24]

Finally, we note that the manufacturer of the SAFs, SMS Siemag AG, has stated that the capacity of two of the SAFs MS Si intends to install and operate is 33,000 tpy of silicon.[25] As such, the actual capacity of the SAFs apparently was misrepresented in the MS Si PSD Permit Application and the current MS Si PSD Permit. The stated production limits in the MS Si PSD Permit, therefore, effectively allow for future modification and expansion of production capacity (another potential sham element of the current Permit) with only segmented consideration of BACT and air quality impacts, at best.[26]

In summary, the current MS Si PSD Permit contains sham elements and allows circumvention of current and future NSR requirements because:

- The current permit sets emission limits, production limits and annual material usage limits based on four SAF operation that are inconsistent with the stated two-SAF limit (and greater than the production capacity for two SAFs as specified by the SAF manufacturer), while air quality analyses are based on operation of only two SAFs at any time; and
- The current permit expressly allows for future operation of four SAFs at the MS Si Facility with limited and segmented review under the PSD program, at best.

These defects undermine the basis of the associated BACT determinations and allow for current and future circumvention of PSD requirements in contravention of the Act.

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[24] *See* Letter from Gregg M. Worley (EPA Region 4, Chief Air Permits Section) to Harry M. Wilson, III (MDEQ, Environmental Permits Division) (June 27, 2011) (hereinafter "EPA Region 4 Response to MDEQ PSD Applicability Determination Questions") at 2 (http://www.epa.gov/region07/air/nsr/nsrmemos/boilcatg.pdf); Guidance on Limiting PTE in NSR Permitting at 10; and Limiting PTE in NSR Permitting Guidance.

[25] *See* Engineering News, "SMS Siemag to build two efficient SAFs for silicon production in the USA," (Feb. 24, 2014), available at: http://www.engineeringnews.co.za/article/sms-siemag-to-build-two-efficient-safs-for-silicon-production-in-the-usa-2014-02-24. ("Mississippi Silicon LLC. placed an order with SMS Siemag, Germany, www.sms-siemag.com for the supply of two submerged arc furnaces for the production of silicon. **The annual capacity of the two furnaces is 33,000 tons.**") (Emphasis supplied.)

[26] For example, the current MS Si PSD Permit BACT limit for NO_x emissions is set at 45 pounds of NO_x per ton of silicon produced. However, the current permit also allows for 1,906.2 tpy of NO_x to be emitted per the above calculations.

C. PTEs for Toxic Pollutants – Now Subject to NESHAP Requirements – Were Grossly Underestimated; Site-Specific MACT Determination Requirements Were Improperly Omitted

The PTE for emissions of HAPs in the MS Si PSD Permit Application and incorporated into the MS Si PSD Permit Preliminary Determination were grossly underestimated. As a result, the MS Si PSD Permit incorrectly classifies the proposed MS Si Facility as a "minor" source of HAPs rather than correctly designating the MS Si Facility as "major" source of HAPs. PTE calculation errors for HAPs emissions from the MS Si Facility include, *inter alia*, (i) the omission of hydrogen chloride ("HCl") and hydrogen fluoride ("HF") emissions from coal combustion HAPs calculations (coal is used in manufacturing silicon metal), (ii) underestimation of HAPs emissions from wood combustion (also used in the manufacturing of silicon metal), (iii) the complete failure to calculate HAPs emissions from quartz, flux additives and electrodes (all likewise consumed in the manufacturing of silicon metal), and (4) the omission of emissions of sulfuric acid (H_2SO_4) from the SAFs based on the incorrect assumption that the conversion of SO_2 to H_2SO_4 is negligible.

Consequently, combined HAP emissions from MS Si Facility SAFs appear to have been underestimated by approximately ninety percent (*i.e.*, MS Si Facility combined HAP emissions from the SAFs in permit application calculated at 12.91 tpy in the MS Si PSD Permit Application compared to greater than 110 tpy if HAPs emissions from coal and wood combustion are properly calculated alone). Single HAP pollutant emissions of HCl from coal combustion alone should have been estimated as greater than 10 tpy; while combined HAP emissions should have been estimated to be significantly greater than 25 tpy.[27]

Quartz also contains impurities that were not considered as potential sources of HAPs. The MS Si PSD Permit, however, fails to evaluate this issue and obviously has no enforceable limits on HAP impurities in quartz fed into the SAFs. The impurities in metallurgical quartz include mercury, arsenic, beryllium, cadmium, cobalt, chromium, manganese, nickel, lead and selenium.[28] EPA considers mercury, arsenic, beryllium, cadmium, chromium and lead to be volatile, semi-volatile or low volatility metals. These impurities also can pass into the gas phase of the silicon furnace "if the reduced or oxidic species are volatile."[29] Using a value as low as

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[27] *See* Review of MS Si PSD Permit HAP Calculations (Attachment 1).
[28] *See, e.g.*, Dal Martello, "Impurity Distribution and Reduction Behaviour of Quartz in the Production of High Purity Silicon," (September 2012) (http://www.diva-portal.org/smash/get/diva2:551977/FULLTEXT01.pdf); and Aasly, "Properties and Behavior of Quartz for the Silicon Process," (August 2008) (http://www.diva-portal.org/smash/get/diva2:124782/FULLTEXT02).
[29] Dal Martello *et al.* "Trace Elements in the Si Furnace-Part II: Analysis of Condensate in Carbothermal Reduction of Quartz" Metallurgical & Materials Transactions. Part B; Vol. 44 Issue 2 (April 2013).

0.01% of the silicon input into the SAFs to represent HAP metals that could exit as volatile and condensable HAP emissions yields a PTE of 21.3 tpy of the HAP. The permit contains no consideration of HAPs in the quartz, but it is clear that lacking an enforceable limit on HAP constituents in the quartz, MS Silicon could become a major source of HAP unless the input HAP is limited to 0.01% of the quartz fed to the SAFs.

Table 2 – Impurities in Quartz Contribute to Potential to Emit HAP

HAP	% HAP	Tons HAP/year
HAP Metal Impurities in Quartz	0.010%	21.3

Other potential sources of HAPs emissions include additives or fluxes that are used in the SAFs and in SAF electrodes that are depleted during silicon metal production. In addition, products of incomplete combustion and dioxins/furans would be expected to be substantial from the MS Si Facility – an emission source with a reducing combustion environment and a long temperature quench zone to the baghouse – but these are not included in the MS Si HAPs calculations. Further, none of these HAPs emission sources appear to be included in the MS Si PSD Permit Application or addressed in the MS Si PSD Permit prematurely issued by MDEQ.

Additionally, the emission estimates in the MS Si Permit Application do not include emissions of H_2SO_4 from the SAFs. As shown in the footnotes to Table 2-2a in the MS Si Permit Application, the sulfuric acid emissions are assumed to be zero, because the "conversion of SO_2 to H_2SO_4 is assumed to be negligible." However, stack tests of similar furnaces in the silicon-making industry indicate that the sulfuric acid emissions are significant. For example, compliance tests performed on a single furnace at silicon maker WVA Manufacturing LLC in West Virginia on June 14, 2011, indicated an average sulfuric acid emission rate of 1.4 pounds per hour. This equates to a potential annual emission rate of 6.1 ton/yr. The furnace in West Virginia was producing at a rate of 1.94 ton/hr during the test, which is slightly below the capacity of one of the furnaces MS Si proposes to install. Considering the PSD threshold of 7 tons per year established for sulfuric acid emissions, it is likely that the proposed MS Si plant will trigger the PSD review requirements for this pollutant, including analysis and implementation of BACT controls.

Finally, the MS Si Permit Application failed to provide emissions estimates based on the actual equipment and materials to be used at the proposed MS Si Facility. Rather, the MS Si PSD Permit Application used, and the MS Si PSD Permit incorporated, surrogate emission factors intended for non-production equipment such as boilers for estimation of SAF emissions, despite the fact that a boiler is an optimized combustion device. The SAFs to be installed and

operated at the MS Si Facility, which will burn carbon sources such as coal and wood to reduce metal oxides to elemental metal, are clearly not optimized combustion devices like a boiler.

An SAF creates a reducing environment where the silicon oxide input (quartz) is reduced to elemental silicon by partial combustion of coal and wood. The oxidation that does occur takes place in the headspace of the SAF, but at highly ventilated conditions to ensure that carbon monoxide in the SAF does not reach an explosive level. Hence, the coal and wood are pyrolized in an oxygen-deprived environment and the opportunity for more complete combustion is limited.

Studies of coke oven and oxygen-starved wood stove combustion show that products of incomplete combustion – benzene, toluene and ethylbenzene, xylenes or "BTEX," ammonia and other air toxicants – are generated under oxygen-deprived conditions during combustion. Lacking actual emissions data, MS Si should use emissions factors that are more representative and protective of human health and the environment, such as those associated with coke ovens and other oxygen-starved combustion processes. The resulting elevated emissions of ammonia will increase $PM_{2.5}$ emissions and the inherent incomplete combustion will increase emissions of condensable organic PM smaller than 2.5 microns. Such omissions and underestimation of emissions from the operation of the proposed MS Si Facility also call into question the validity of the applicant's air quality impacts modeling.

In short, HAP emissions from the proposed MS Si Facility are grossly underestimated. MDEQ clearly and egregiously erred in not designating the MS Si Facility as a major source of HAPs subject to NESHAP program requirements. The current HAP emission estimates incorporated in the MS Si PSD Permit are incomplete and substantially underestimate PTE for HAP emissions from coal and wood combustion, and these calculations completely omit HAP emissions from other materials utilized in the SAFs at the proposed facility. Miscalculation of the MS Si Facility PTE for HAPs has resulted in the MS Si PSD Permit incorrectly designating the proposed MS Si Facility as a minor source of HAPs and that, in turn, led to a failure to require in the Permit control strategies to reduce HAPs. Moreover, as a greenfield new major source in a source category without an applicable MACT standard, MS Si and MDEQ should have performed a case-by-case MACT analysis subject to review and comment by EPA, Affected States and the public. Such an omission must be rectified immediately to protect public health, in accordance with section 112 of the CAA, rather than waiting until a Title V operating permit is issued.

D. MDEQ's Issuance of the MS Si PSD Permit Violated Fundamental Public Notice Requirements

MDEQ also violated fundamental public comment requirements and compromised public

participation rights under sections 160(5) and 165(a)(2) of the Act in the process of fast-tracking issuance of the MS Si PSD Permit -- apparently under sustained political pressure from the President Pro Tempore of the Mississippi State Senate.[30] To date, we have identified the following public participation deficiencies relating to the MS Si PSD Permit:

- MDEQ's public notice for the MS Si PSD Permit did not notify the public of its statutory right to a public comment hearing per section 165(a)(2) of the Act.[31]
- MDEQ's public notice for the MS Si PSD Permit did not advise the public that certain documents including the permit application, MDEQ's preliminary determination, and MDEQ's air analysis and supporting documents were available at the Burnsville Library (*i.e.*, a local repository), as required by 40 C.F.R. § 51.166(q)(iii).[32]
- According to Ms. Viola South, the Burnsville Librarian,[33] the MS Si PSD permit file was received by the Burnsville Library on October 24, 2013, and only included (i) the draft MS Si PSD Permit with emission standards and limitations and (ii) the MDEQ Preliminary Determination of Approval for Mississippi Silicon LLC Facility No. 2640-00060 (October 21, 2013) (hereinafter "MDEQ MS Si PSD Permit Preliminary Determination").[34] Apparently, the MS Si PSD permit file at the Burnsville Library did not include the MS SI PSD Permit Application, complete air quality impact modeling results[35] or other supporting documents that are required to be available at the local repository per 40 C.F.R. § 51.166(q)(iii).
- The public comment period ran from October 24, 2013 to November 22, 2013 – 29 days rather than 30 days as required by the Mississippi SIP at APC-S-2.IV.C.2 and federal

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[30] *See* E-mail correspondence between Trudy Fisher (MDEQ Executive Director), Richard Harrell (MDEQ Director, Office of Pollution Control), and Harry M. Wilson (MDEQ Chief, Environmental Permits Division) entitled "Mississippi Silicon, Burnsville MS" (August 21, 2013) (Attachment 2); and E-mail correspondence between Trudy Fisher (MDEQ Executive Director) and Richard Harrell (MDEQ Director, Office of Pollution Control) entitled "Senator Terry Brown" (February 5, 2014) (Attachment 3).

[31] *See* MDEQ MS Si Public Notice (October 24, 2013) (Attachment 4).

[32] *See id.*

[33] Telephone conference between Susan J. Eckert, Esq. and Viola South (March 18, 2014); *see also* MDEQ MS Si PSD permit notice to the Burnsville Library (Attachment 5).

[34] Though the MDEQ MS Si PSD Permit Preliminary Determination includes an air quality analysis, the MDEQ air quality analysis was deficient on its face since air quality modeling results were submitted to MDEQ on November 22, 2014, and air quality issues remained unresolved from EPA's perspective at least as late as February 5, 2014.. *See* E-mail correspondence between Trudy Fisher (MDEQ Executive Director) and Richard Harrell (MDEQ Director, Office of Pollution Control) entitled "Senator Terry Brown" (February 5, 2014) (Attachment 3). Additional inadequacies within the MS Si PSD Permit air quality modeling demonstrations and air quality analysis or impact analysis are outlined sections E and F, *infra.*

[35] A timeline describing when MS Si PSD Permit air quality impact modeling results were submitted to MDEQ in relation to the public comment period and notice to Affected States and the Federal Land Manager is set forth in MS Si PSD Permit Public Notice and Air Quality Modeling Timeline (Attachment 6).

regulations at 40 C.F.R. § 51.161(b)(2).[36]

In addition, affected and contiguous states such as Alabama and Tennessee ("Affected States") as well as the Federal Land Manager ("FLM") for the Sipsey Wilderness Area were not provided with all of the air quality modeling results for the proposed MS Si Facility.[37] Affected States also apparently were not provided 60 days to review and comment on the draft MS Si PSD Permit as required by section 126(a) of the Act.[38]

As noted above, the opportunity for a public comment hearing was not referenced in the MDEQ MS Si PSD Permit public notice nor provided by MDEQ, in clear contravention of section 165(a)(2) of the Act, apparently due to a defect in the Mississippi SIP that does not provide a mandatory right to a public hearing for PSD permits. The Mississippi SIP provides that "the Permit Board **may** hold a public hearing on any application for a construction permit or State Operating Permit if it determines that there is sufficient interest in the application." (Emphasis supplied.)[39] When faced with a similar defect in the Texas SIP, EPA disapproved the 1999 Texas SIP because the proposed Texas rules failed to contain a provision requiring the "TCEQ to provide an opportunity for a public hearing for interested persons to appear and submit written or oral comment on the air quality impact of the source, alternatives to it, the control technology required, and appropriate considerations and to provide notice of the opportunity for a public hearing, as required by 40 C.F.R. § 51.166(q)(v) and section 165(a)(2) of the Act."[40]

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[36] While MDEQ regulations are silent on how public comment time periods are to be computed, standard practice and the Mississippi Rules of Civil Procedure Rule 6(a) dictate that the day or event for which a designated time period begins is not included in the computation of time. *See also* EPA regulations at 40 C.F.R. § 124.20(a) and Federal Rules of Civil Procedure Rule 26(a)(1), which also make clear that the day the public notice is posted is not included in the computation of time.
[37] *See* MS Si PSD Permit Public Notice and Air Quality Modeling Timeline (Attachment 6).
[38] *See* Letter from Honorable Dr. Quinton T. Ross, Jr., (Alabama State Senate, 26th District) to Gina McCarthy (Attachment 7), Letter from Honorable Greg J. Reed (Alabama State Senate, 5th District) to Gina McCarthy (EPA Administrator) (March 20, 2014) (Attachment 8), and Letter from Honorable Roger H. Bedford, Jr., (Alabama State Senate, 6th District) to Gina McCarthy (EPA Administrator) (March 19, 2014) (Attachment 9).
[39] Mississippi Commission on Environmental Quality, Commission Regulation APC-S-2, § IV.M, "Public Participation and Public Availability of Information" as contained in "Permit Regulations For The Construction And/Or Operation of Air Emission Equipment," (http://www.epa.gov/region4/air/sips/ms/toc_ms.htm).
[40] 73 Fed. Reg. 72001, 72007 (November 26, 2008). Subsequently, the TCEQ made revisions to the proposed 1999 Texas SIP language and submitted those to EPA, known by EPA as "the Texas Public Participation SIP submittal from July 2, 2010 since the majority of the revisions were submitted on that date." 79 Fed. Reg. 551 (January 6, 2014). According to the Texas Register, the new proposed Texas SIP rules on public participation contained a requirement of a mandatory public meeting on PSD permits upon request without a showing of significant public interest. 35 Tex. Reg. 306, 308 (January 15, 2010). On January 6, 2014, EPA approved changes to the proposed Texas SIP language requiring a mandatory public meeting on PSD permits with an effective date of February 5,

GMI filed a request with the MDEQ to conduct a formal hearing to review the MS Si PSD Permit on February 12, 2014.[41] By letter dated February 18, 2014, MDEQ Executive Director Trudy D. Fisher denied GMI's request, claiming that GMI's request was untimely,[42] and in so doing failed to follow MDEQ's established practice concerning the calculation of the time period for such a request. Accordingly, on March 6, 2014, GMI filed, in Mississippi state court, an administrative appeal and complaint[43] challenging MDEQ's denial of GMI's request for an evidentiary hearing.

In all of these respects, the administrative record establishes that MDEQ repeatedly acted to limit the public's ability and that of other stakeholders including Affected States, the FLM and EPA to assess and comment on whether the draft MS Si PSD Permit was legally deficient, prior to its issuance, all in a concerted effort to fast-track the process. In doing so, MDEQ committed numerous violations of federal and state SIP public notice requirements relating to the issuance of PSD permits, which materially compromised public participation as well as the ability of Affected States and the FLM to evaluate fully and accurately the air quality impacts of the emissions from the proposed MS Si Facility. Indeed, the public comment period and the period for review by the FLM and Affected States closed on November 22, 2013, the same day that "Addendum #2, Updated Air Quality Impact Evaluation (Criteria Air Pollutants)" for the MS Si PSD Permit was submitted to MDEQ on behalf of the applicant, in clear and egregious violation of the requirements of the Act and applicable federal regulations for public participation as well as review by Affected States and the FLM. We submit that EPA, therefore, must act to ensure that the rights of the public and other stakeholders provided by the Act are protected.

E. MS Si Modeling Demonstrations Were Inadequate

As a threshold matter, as described in greater detail in sections A.2, B, and C, *supra*, MS Si Facility PTE calculations for PSD pollutants including, *inter alia*, SO_2, NO_2, CO, PM known as PM_{10} and $PM_{2.5}$, and PM condensables were underestimated in the MS Si PSD Permit Application. As a result, the MS Si PSD Permit issued by MDEQ incorporated production limits that are inconsistent with known specifications regarding silicon production capacity and proper emission calculations. Such inaccuracies necessarily compromised the air quality modeling for

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2014.

[41] Letter from Matt Greene (GMI) to Mississippi Environmental Quality Permit Board c/o Trudy D. Fisher, (MDEQ Executive Director), "Request for Formal Hearing," (received February 12, 2014) (Attachment 10).

[42] Letter from Trudy Fisher (MDEQ Executive Director) to Matt Greene (GMI) (denial of request for formal hearing) (February 18, 2014) (Attachment 11).

[43] *See* Globe Metallurgical, Inc.'s Administrative Appeal and Complaint, Cause No. 2014-297 (March 7, 2014) (Attachment 12).

the MS Si Facility summarized in Addendum #2, Updated Air Quality Impact Evaluation (Criteria Air Pollutants) (November 22, 2013) (hereinafter "Report" or "Modeling Report").

Moreover, the Class II area modeling demonstration for the MS Si Facility was inadequate because, among other reasons:

- The meteorological station used for the modeling is not representative of the proposed MS Si Facility site;
- Several existing emissions sources were excluded from the modeling, thereby understating air quality impacts;
- Actual rather than allowable emissions were used for existing neighboring sources, contrary to established modeling guidance;
- The receptor network did not have sufficient resolution to accurately identify the locations of maximum impact; and
- The culpability analysis conducted was inadequate to detect whether the facility would be a significant contributor to a predicted NAAQS violation.

A thorough review of these modeling deficiencies is presented below and compels the conclusion that the air quality modeling analyses that MS Si submitted to MDEQ fail to establish that operation of the proposed MS Si Facility will not violate ambient standards for the foregoing pollutants.

1. The Meteorological Data Used In The MS SI PSD Permit Modeling Demonstration Is Not Representative Of The Proposed MS Si Site

The modeling demonstration used the meteorological dataset provided on the MDEQ website for Tupelo Regional Airport (station KTUP), located approximately 45 miles southwest of the proposed MS Si site.[44] Evaluation of whether this data is representative of the site was limited to a subjective comparison of land use within a 1-km radius of the station and the proposed site. A more detailed review of this dataset reveals characteristics of wind "channeling" due to valley-like terrain (*i.e.,* wind mainly from northwest or southeast) that are not be representative of the proposed MS Si Facility site. Moreover, more appropriate meteorological data is available from a station closer to the MS Si site (40 miles east in Muscle Shoals, AL, station KMSL) that has similar land use and does not exhibit characteristics of channeling.

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[44] AERMET Preprocessed Met Data: http://www.deq.state.ms.us/MDEQ.nsf/page/epd_AERMET_Preprocessedmetdata?OpenDocument.

The KTUP station descriptor indicates that the wind speed/direction instrumentation does not have a heater, so AERMINUTE/AERMET (software that pre-processes meteorological data) gives data files with a minimum wind speed of 1.02 m/s and 4,669 (10.6%) calm hours over 5 years. Meanwhile, the KMSL station descriptor indicates that the wind speed/direction instrumentation does have a heater, so AERMINUTE/AERMET gives data files with minimum wind speed of 0.51 m/s and 1,857 calm hours (4.2%) over 5 years.

The presence of a heater on the instrumentation is significant, as the heater impacts the lower threshold for wind speed when input properly into the AERMINUTE/AERMOD system. The use of the KTUP dataset results in the model ignoring all hours with wind speeds less than 1.02 m/s, while the KMSL dataset provides data down to 0.51 m/s. Not only is this KMSL dataset a materially more complete dataset (96% complete vs. 90% complete), but peak concentrations are commonly associated with low wind speeds, so it would be expected to be more appropriate for the purposes of comparison to concentration limits.

Accordingly, the use of KTUP, with its higher wind speed threshold, would not be conservative and would not identify concentrations associated with lower wind speeds. The MS Si Modeling Report did not identify the KMSL station, or any other alternate stations, and did not justify the choice of Tupelo over more appropriate alternatives. For this reason alone, the MS Si modeling demonstration is inadequate.

2. Nearby Sources Were Improperly Excluded In The MS Si PSD Permit Cumulative Modeling

The modeling demonstrations relied upon for the MS Si PSD Permit were based on source inventories received from Mississippi, Alabama and Tennessee. The proposed MS Si Facility is approximately 20 km from Alabama to the east, and 20 km from Tennessee to the north. Based on the Modeling Report, Significant Impact Areas ("SIAs") extend to 50 km from the proposed facility – *i.e.,* well into both Alabama and Tennessee. The Modeling Report indicated that the number of sources to be modeled was reduced by (i) excluding all fugitive or volume sources, and (ii) applying the North Carolina Q/D rule. However, there were numerous deficiencies in selection of sources and emission units to be included in the cumulative modeling that render the MS Si modeling demonstration inadequate as discussed below.

a. All Fugitive/Volume Emission Units At Nearby Sources Were Improperly Excluded From The MS Si PSD Permit Air Quality Modeling

All fugitive/volume emission units at existing nearby sources were excluded from the air quality analysis regardless of size (*i.e.*, emission rate) or location. This omission included all

sources where stack parameters were not provided, such as distributed combustion sources (NO_x and SO_2) at a facility. The Modeling Report states at 3-1 that "The rationale for excluding fugitive/volume sources is that these types of sources will have their maximum point of impact within a few hundred meters of a facilities property boundary and would have minimal impacts on sources located several kilometers downwind." This rationale, however, is not valid.

Fugitive/volume source emissions have the potential to result in high concentrations relative to stack emissions. These fugitive/ volume source emissions may result in localized violations where facility emissions contribute significantly to the violation, and would generally increase downwind concentration in the modeling domain. Accordingly, without inclusion of these fugitive/volume source emissions in the model, and a proper culpability analysis, these sources cannot be shown to be insignificant. In general, the MS Si Modeling Report did not include information on the fugitive/volume source emission units that were excluded, so the impact of this deficiency is unknown and the MS Si modeling demonstration inadequate.

b. The MS Si PSD Permit Air Quality Modeling Report Incorrectly Applied The North Carolina Q/D Rule

The Modeling Report states that the North Carolina Q/D rule was applied to screen out insignificant sources, which is commonly applied in NAAQS demonstrations. For this analysis, D is:

- The distance between the subject facility and a nearby source for short term analysis (e.g., 1 hour or 24 hours); or
- The distance from the edge of the SIA to the nearby source for long term analysis (e.g., annual).

The NSR Workshop Manual specifies at C-26 that there is only one SIA for a specific pollutant. If there are multiple averaging periods (*e.g.*, 1 hour, 24 hour, annual) for a pollutant, the radius of the SIA is determined by the averaging period with significant impact extending farthest from the facility.

The modeling provided in support of the permit application, however, incorrectly applied the Q/D rule by using incorrect values for D. The value of D used was based on distance from the proposed MS Si facility to a nearby source only, irrespective of whether it was long- or short-term modeling. In addition, the radius of the SIA was incorrectly calculated individually for each time period rather than applying the radius with significant impact extending farthest from the facility. Together, these two errors resulted in numerous sources being omitted from the analysis, whereas the stated procedure, correctly applied, would have included them. The improper application of the North Carolina Q/D rule, therefore, renders the MS Si PSD Permit

modeling demonstration inadequate.

c. Other Existing Point Sources Appear To Have Been Improperly Omitted From The MS Si PSD Air Quality Modeling Report

GMI's air consultant, ENVIRON CORP ("ENVIRON"), has requested emission inventories of existing sources from Mississippi, Alabama, and Tennessee to investigate whether the tables in the Modeling Report accurately reflect state inventories. At this time, ENVIRON has received such an inventory only from Tennessee. All but one source in the Tennessee emission inventory was screened out in the Modeling Report using the Q/D rule. For that particular source, the inventory from Tennessee includes a total of 26 emission units.

In comparison, the MS Si PSD Permit Modeling Report provided in support of the permit application only identified fourteen (14) emission units, and only twelve (12) of those emission units were modeled. Of the emission units that were excluded from the model, four (4) were fugitive/volume sources, and ten (10) were point sources with stack parameters. For this one Tennessee facility, the sources that were omitted comprise approximately 10% of the total source emission for PM_{10}, and approximately 8% of the total emission for $PM_{2.5}$. The MS Si Report does not mention that emission units were omitted nor provide any rationale for omission of these emission units other than stating that fugitive/volume sources and sources screened out by Q/D. *See* Modeling Report at 3-1, 3-2.

Even with access to only one state dataset, GMI's consultants have established that MS Si excluded significant emissions without justification. It remains possible or likely that this is no coincidence and that other significant sources were systematically excluded throughout the entire modeling domain. In any event, it is clear that the MS Si modeling demonstration is inadequate because existing sources were either improperly omitted or screened out under the North Carolina Q/D rule.

3. The MS Si PSD Permit Final Modeling Demonstration Used "Actual" Emissions Rather Than "Allowable" Emissions For Nearby Source Emission Rates In Contravention Of The Federal Guideline On Air Quality Modeling

The administrative record for the MS Si PSD Permit reflects that earlier iterations of the modeling of existing sources were conducted using "allowable" emission rates but failed to demonstrate NAAQS compliance. *See* Modeling Report at 3-2. The final modeling demonstrations of the 1-hr NO_2 and SO_2 NAAQS for the MS Si PSD Permit, however, were "tweaked" to demonstrate NAAQS compliance by using "actual" emission rates for two nearby

sources[45] rather than "allowable" emission rates as directed by applicable EPA regulations. This was clearly improper, since the applicable EPA "Guideline on Air Quality Models" specifies that the emission rates used for nearby sources in a NAAQS demonstration must be the maximum **allowable** emission limit or federally enforceable permit limit.[46]

In this instance, the failure to use "allowable" emissions in the MS Si PSD Permit Modeling Report has profound implications. Actual SO_2 emissions for the one source were about one fifteenth (*i.e.,* more than 93% lower) than the "allowable" emissions for the source as given in the state inventory. Without this improper reduction resulting from use of actual emissions, rather than allowable emissions as mandated by EPA regulation, the Modeling Report necessarily would have found that emissions from the proposed MS Si Facility will contribute significantly to a violation of the SO_2 1-hr NAAQS.

In addition, actual NO_x emissions for the two sources were about one seventh (*i.e.,* more than 85% lower) than the "allowable" emissions for these sources as given in the state inventory. Without this improper reduction, the proposed MS Si Facility would be extremely close to contributing significantly to a violation of the NO_2 1-hr NAAQS. Moreover, the use of allowable emissions together with correction of other deficiencies in the MS Si PSD Permit Modeling Report (*i.e.*, exclusion of numerous nearby emission units, lack of fine receptor grid, inappropriate background concentration, met data, culpability analysis) may and likely would result in a significant contribution to violation of the NO_2 1-hr NAAQS. The MS Si modeling demonstration fails, therefore, to adequately demonstrate compliance with the NO_2 1-hr NAAQS.

4. Receptor Network Was Not Sufficient To Estimate The Highest Concentrations And Possible NAAQS Or PSD Increment Violations

EPA's "Guideline on Air Quality Models," *supra* fn. 46, provides at § 7.22.a that "[r]eceptor sites for refined modeling should be utilized in sufficient detail to estimate the highest concentrations and possible violations of a NAAQS or a PSD increment." Further, EPA guidance requires a fine receptor grid (*e.g.,* 100 m) to identify the areas of highest concentration. *See* NSR Workshop Manual at C-40.

The modeling demonstration included a 100 m x 100 m receptor grid extending only to 2 km from the proposed MS Si Facility site. However, a fine receptor grid was not provided in all

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[45] Note that only one of these sources was a significant emitter of SO_2.
[46] *See* 40 C.F.R. Ch. I, pt. 51, Appx. W, table 8-2, at 571 (July 1, 2011 ed.), available at http://www.gpo.gov/fdsys/pkg/CFR-2011-title40-vol2/pdf/CFR-2011-title40-vol2-part51-appW.pdf.

areas of NAAQS violation and where contribution of the facility exceeded the SIL. For NO_2 and SO_2, violations and contribution exceeding the SIL extended beyond the limit of the coarse receptor grid (*i.e.*, 2,000 m spacing to 50 km from the facility). Therefore, the receptor network was not sufficient to estimate the highest concentrations and possible violations of a NAAQS or a PSD increment.

5. The MS Si Culpability Analysis

If there is a modeled NAAQS violation, a culpability analysis must show that the facility did not contribute significantly to any violation. *See* NSR Workshop Manual at C-52. Stated another way, this demonstration must be performed for each violation that occurs at each location (*i.e.*, combination of time and location).

In contrast, when violations of the NAAQS were found, the MS Si PSD Permit Modeling Report at 3-9 stated that the culpability analysis involved modeling of facility contribution at a few receptors "downwind" of existing sources. Consequently, the culpability analysis is inadequate since the facility contributions at each violation (in time and location) are not considered. As such, the culpability analysis presented in the Modeling Report fails to establish that the MS Si Facility does not contribute to a NAAQS violation.

The inadequacies of the culpability analysis are particularly important since the Modeling Report suggests that the MS Si Facility does not contribute to a violation of the NAAQS when allowable emissions are used for two nearby sources. *See* Modeling Report at 3-9. However, a proper culpability analysis (*i.e.*, the use of MAXDCONT in AERMOD) shows that the MS Si facility will certainly contribute to an SO_2 violation if allowable emission rates are used for nearby sources in accordance with EPA's Guideline on Air Quality Models, *supra* fn.46.

F. MS Si PSD Permit Air Quality Analysis Was Inadequate

The MS Si PSD Permit air quality analysis contains inadequacies relating to the following:

- Background ambient concentration;
- Nitrogen Dioxide (NO_2);
- Particulate Matter ($PM_{2.5}$);
- Sulfur Dioxide (SO_2);
- Ozone Impact Analysis; and
- Preconstruction Monitoring.

1. Background Ambient Concentration

No pre-construction monitoring of background ambient concentration was undertaken for any pollutant as part of the MS Si Facility air quality analysis. The applicant argued that "sufficient ambient monitoring is being conducted, and would be deemed representative thus no preconstruction monitoring will be required." Modeling Report at 2-5. However, in some cases the monitors selected for estimation of the background ambient concentration were located within Mississippi only. This approach ignored closer, more appropriate monitors located in Alabama and Tennessee, as discussed below.

2. Nitrogen Dioxide (NO_2)

The NO_2 monitor selected for the analysis is located in Pascagoula, MS, a city on the Gulf Coast, approximately **305 miles south** of the proposed MS Si Facility site. No justification was provided as to how or why this distant monitor could be considered representative of the proposed MS Si Facility site. Notably, the 1-hour design value is 34 ppb for the Pasagoula, MS, NO_2 monitor. Moreover, three other monitors in Tennessee – all closer to the proposed MS Si Facility site, ranging from 129 to 215 miles away – were not utilized in the air quality analysis. Two of these monitors report concentrations higher than the selected monitor. The closest, in Nashville, Tennessee, reports a 1-hour value over 9 ppb (17 $\mu g/m^3$) higher than the selected value.

Axiomatically, an increase of this magnitude in the background ambient concentration of NO_2 used in the cumulative analysis would greatly increase the area over which NO_2 violations occur, and increase the likelihood that the proposed MS Si Facility will contribute significantly to a violation of the 1-hour NO_2 NAAQS. The MS Si Facility air quality analysis for NO_2, which fails to utilize data from more appropriate NO_2 monitors is therefore inadequate, and plainly so.

3. Particulate Matter ($PM_{2.5}$)

The $PM_{2.5}$ background concentration used in the cumulative analysis (*i.e.*, 9.65 $\mu g/m^3$ annual) is based on the average of two Mississippi monitors (*viz.*, Hernando in Desoto County, and Grenada in Grenada County), which are 95 and 112 miles from the proposed MS Si Facility site, respectively. Again, other monitors closer to the proposed MS Si Facility site – eight monitor locations with complete data – were not utilized in the air quality analysis. Concentrations at these monitors ranged from 8.6 to 10.7 $\mu g/m^3$ annual. The closest (Muscle Shoals, AL) is only 25 miles to the east and is located in a rural, low-density residential area similar to the proposed site that reports a $PM_{2.5}$ concentration of 9.9 $\mu g/m^3$ annual. The second closest monitor (Tupelo, MS) is 45 miles away, and reports 10.6 $\mu g/m^3$ annual. No justification was provided as to how or why the two selected monitors could be considered more

representative of the proposed MS Si Facility site than the many closer monitors, or why an average of two monitors is considered conservative under the circumstances.

Moreover, an increase of only 0.55 $\mu g/m^3$ (annual) in the background ambient concentration used in the cumulative analysis would result in violations of the NAAQS. Together with corrections of deficiencies identified above, the use of the closest monitor would trigger violations of the annual $PM_{2.5}$ NAAQS. The MS Si Facility air quality analysis for $PM_{2.5}$ is therefore inadequate.

4. Sulfur Dioxide (SO_2)

The SO_2 monitor selected for the analysis is likewise located in Pascagoula, MS, a city on the Gulf Coast, approximately 305 miles south of the proposed MS Si Facility site without any justification given as to why this monitor would be considered representative of the MS Si Facility site. The 1-hr design value is 27 ppb. Again, there are other monitors closer to the proposed MS Si Facility site – five monitors in Tennessee and Alabama – with complete data that are less than 200 miles from the proposed MS Si Facility site. Reported concentrations range from 11.7 to 53.7ppb (1-hr). The average concentration reported by the monitors within 200 miles is 40.8 ppb.

Without the improper reduction of nearby source emission rates to actual levels as opposed to allowable as discussed in section F.3, *supra,* the MS SI Facility as currently permitted will contribute significantly to a violation of the SO_2 1-hr NAAQS. In addition, an increase in the background ambient concentration of SO_2 – which is more representative of the proposed MS Si Facility site – is likely to increase both the frequency and severity of these SO_2 violations. The MS Si Facility air quality analysis for SO_2 is therefore inadequate.

5. Ozone Impact Analysis

A net emissions increase of 100 tons per year or more of volatile organic compounds ("VOCs") or NO_x requires an ambient impact analysis for ozone, including the gathering of ambient air quality data. The proposed MS Si Facility as currently permitted will emit more than 100 tpy of VOCs and NO_x. *See* Modeling Report at Table 4-5. The MS Si PSD Permit ozone impact analysis is deficient because it is based on information that is not representative of the proposed MS Si Facility site.

The MS Si PSD Permit ozone impact analysis is based on an ambient ozone background concentration of 74 ppb, compared to the 8-hr NAAQS of 75 ppb, so there is little room for uncertainty in this ozone impact analysis. Yet the MS Si air quality impact analysis for ozone relies on the change in ozone level based on VOC/NO_x emissions in the State of Wisconsin. No

scientific justification was provided as to how or why the Wisconsin VOC/NO_x emissions data could be representative of meteorological conditions or ambient conditions in Tishomingo County, Mississippi. The MS Si ozone impact analysis is therefore inadequate. Indeed, in light of the high ambient ozone background concentration, absent a site specific analysis conducted at the proposed location of the MS Si facility, the ozone impact analysis must be presumed inadequate and deficient.

6. Preconstruction Monitoring

Apparently due to the applicant's difficulty identifying background ambient monitoring data that were representative of the site, monitors up to 300 miles away were selected in lieu of preconstruction monitoring. The applicant provided no justification, however, for the selection of a monitor some 300 miles away over numerous, much closer monitors with complete datasets. We doubt the applicant can demonstrate that a monitor so far away may be considered representative of conditions at the proposed site, particularly where many closer monitors exist. Moreover, we note that there is considerable variability in concentrations reported by all of these monitoring stations, such that it would be more appropriate to conduct preconstruction monitoring to identify reliable values of background ambient concentration for input into MS Si Facility air quality analyses.

G. The MS Si PSD Permit Contains Unenforceable Permit Conditions

The MS Si PSD Permit contains unenforceable permits conditions that do not assure compliance with emission limitations or compliance with NAAQS and AQRVs at Class I areas including the Sipsey Wilderness Area in Alabama. In this regard, the NSR Workshop Manual at B-56 states:

> **BACT emission limits or conditions must be met on a continual basis at all levels of operation** (e.g., limits written in pounds/MMbtu or percent reduction achieved), demonstrate protection of short term ambient standards (limits written in pounds/hour) and be enforceable as a practical matter (contain appropriate averaging times, compliance verification procedures and recordkeeping requirements). (Emphasis supplied.).

Here, the MS Si PSD Permit term III-54 does not limit emissions in a manner that is enforceable as a practical matter, because coal usage (MS Si PSD Permit term III-11), and silicon production beyond the manufacturer's specifications for the planned SAFs (MS Si PSD Permit term III-1), are allowed elsewhere in the permit. In addition, MS Si PSD Permit term III-25 establishes a SO_2 BACT limit of 52.0 lbs/ton of silicon produced that apparently may be

waived by the permittee whenever deemed technically infeasible (presumably at the discretion of the permittee). MS Si PSD Permit term III-25 for SO_2 provides:

> BACT: 52.0 lbs/ton (averaged over a 3-hour period) of Silicon produce; and **Utilization of Low Sulfur Content Material (where technically feasible**). (Emphasis supplied.).

As discussed in section A.2, *supra,* this permit term evidences that review of technical feasibility issues in the BACT analysis did not set a BACT limit and that the matter is still a variable impacting the allowable emissions limitation under the current MS Si PSD Permit. Moreover, the cost of low sulfur coal material is expressly identified as a consideration in determining technical feasibility in the MS Si PSD Permit SO_2 BACT analysis. Axiomatically, technical feasibility should have been determined in the BACT analysis and is not an appropriate modifying factor to be included as a basis for potential relief from a permit limitation in the MS Si PSD Permit. In essence, MS Si PSD Permit term III-25 implies that a SO_2 BACT limitation is not definitively established and may be waived by the permittee based on economic considerations.

> **Any permit limitation can legally restrict potential to emit if it meets two criteria: 1) it is federally enforceable** as defined by 40 C.F.R. Sections 52.21(b) (17), 51.165(a) (1) (xiv), 51.166(b) (17), *i.e.*, contained in a permit issued pursuant to an EPA-approved permitting program or a permit directly issued by EPA, or has been submitted to EPA as a revision to a State Implementation Plan and approved as such by EPA; **and 2) it is enforceable as a practical matter. The second criterion is an implied requirement of the first criterion. A permit requirement may purport to be federally enforceable, but, in reality cannot be federally enforceable if it cannot be enforced as a practical matter.** (Emphasis supplied.).[47]

The SO_2 emission limit in the MS Si PSD Permit, therefore, is not enforceable as a practical matter. Any reliance on the SO_2 emission limitation to assure compliance with NAAQS and AQRV is arbitrary and capricious or otherwise not in accordance with the Act.

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[47] Guidance on Limiting PTE in NSR Permitting at 2.

H. Inadequate Consideration of MS Si Facility Impacts On Air Quality Related Values of Class I Areas

As noted above, two Class I areas, the Sipsey and Mingo wilderness areas, are located within 300 miles of the proposed MS Si Facility site. The air dispersion modeling analyses evaluated the Class I SILs, visibility impairment and sulfate and nitrate deposition impacts. Based on the modeling, emissions of SO_2 were predicted to exceed the 3-hour and 24-hour SILs in Sipsey at least. These significant impacts generally indicate the need to perform a cumulative PSD Class I area increment assessment, whereby the impacts of existing sources of SO_2 on Sipsey will be evaluated to ensure that Class I increments for Sipsey are not exceeded (reference). MS Si has failed to conduct such a cumulative impact assessment. Its analysis of the proposed facility's impacts on the AQRVs at Sipsey is therefore inadequate.

CONCLUSION

As elaborated above, the MS Si PSD Permit contains significant deficiencies under **every** factor identified in the Procedures for EPA to Address Deficient NSR Permits Guidance. Consequently, the MS Si PSD Permit fails to identify all applicable emission limitations – including, *inter alia,* an appropriate site-specific MACT standard to address HAP emissions – to the detriment of the region's air quality and the integrity of the PSD program. More troubling still, many of these permit deficiencies were raised by EPA Region 4 in its written correspondence to MDEQ but were not adequately addressed in MDEQ's and MS Si's responses or in the final MS Si PSD Permit, as issued.

EPA action to address the defects in the MS Si PSD Permit must not be deferred until issuance of the Title V operating permit for the MS Si Facility, as that likely will not take place until the fall of 2017 at the earliest (assuming that the MS Si Title V Permit is issued in accordance with the deadline in section 503(c) of the Act), long after the proposed MS Si Facility has commenced operations and emitted air pollution including HAPs without appropriate pollution control equipment. Moreover, as noted in section B, *supra*, any future BACT determination will then be based on retrofit costs rather than on new construction costs.

Finally, EPA must be mindful that although primary responsibility for administration of the Clean Air Act in Mississippi has been delegated to MDEQ, ultimately, EPA remains responsible for ensuring that MDEQ's administration of the Act meets the minimum requirements of the Act including, *inter alia*, public participation requirements per section 160(5) and 165(a)(2) of the Act, review by Affected States per section 126(a)(1) of the Act, and protection of ambient air in downwind states per section 110(a)(1)(D) of the Act.

Wherefore, GMI respectfully requests that EPA direct MDEQ to reopen the public comment period in order that all deficiencies of the MS Si PSD Permit may be addressed and rectified. Should MDEQ refuse to do so, GMI petitions EPA, in the alternative, to initiate enforcement actions against the permittee and/or MDEQ to cease construction of the MS Si Facility until the public participation requirements of the Act and all other federal and state regulatory requirements are met in accordance with EPA's long-standing NSR enforcement guidance, and a lawful PSD permit is issued.

We would welcome the opportunity to discuss these concerns with EPA Region 4 in even greater detail. Please do not hesitate to contact us if you have any questions regarding the MS Si PSD Permit deficiencies outlined above or if we may otherwise be of assistance. Thank you for your consideration.

Very truly yours,

/s/

Joseph M. Santarella Jr.
Susan J. Eckert

Counsel for Globe Metallurgical, Inc.

Cc: Beverly Banister (EPA Region 4, Director of Air, Pesticides, and Toxics Division)
Honorable Roger H. Bedford, Jr. (Alabama State Senate)
Heather Ceron (EPA Region 4, Chief of Air Permits Section)
Scott Davis, Esq. (EPA Region 4)
Lance R. LaFleur (ADEM, Director)
Steven M. Lohr (USFS)
Janet McCabe (EPA, Acting Assistant Administrator of the Office of Air and Radiation)
Gina McCarthy (EPA, Administrator)
Honorable Greg J. Reed (Alabama State Senate)
Honorable Quinton Ross (Alabama State Senate)
Honorable Hank Sanders (Alabama State Senate)
Heather McTeer Toney (EPA Region 4, Regional Administrator)

List of Attachments

1. Review of MS Si PSD Permit HAP Calculations
2. E-mail correspondence between Trudy Fisher (MDEQ Executive Director), Richard Harrell (MDEQ, Director, Office of Pollution Control), and Harry M. Wilson (MDEQ, Chief, Environmental Permits Division) entitled "Mississippi Silicon, Burnsville MS" (August 21, 2013)
3. E-mail correspondence between Trudy Fisher (MDEQ Executive Director) and Richard Harrell (MDEQ, Director, Office of Pollution Control) entitled "Senator Terry Brown" (February 5, 2014)
4. MDEQ MS Si PSD Permit Public Notice (October 24, 2013)
5. MDEQ MS Si PSD Permit notice to the Burnsville Library
6. MS Si PSD Permit Public Notice and Air Quality Modeling Timeline
7. Letter from Honorable Dr. Quinton T. Ross, Jr., (Alabama State Senate, 26th District) to Gina McCarthy
8. Letter from Honorable Greg J. Reed (Alabama State Senate, 5th District) to Gina McCarthy (EPA Administrator) (March 20, 2014)
9. Letter from Honorable Roger H. Bedford, Jr., (Alabama State Senate, 6th District) to Gina McCarthy (EPA Administrator) (March 19, 2014)
10. Letter from Matt Greene (GMI) to Mississippi Environmental Quality Permit Board c/o Trudy D. Fisher, (MDEQ Executive Director), "Request for Formal Hearing," (received February 12, 2014)
11. Letter from Trudy Fisher (MDEQ Executive Director) to Matt Greene (GMI) (denial of request for formal hearing) (February 18, 2014)
12. Globe Metallurgical, Inc.'s Administrative Appeal and Complaint, Cause No. 2014-297 (March 7, 2014)

STATE OF MISSISSIPPI
PHIL BRYANT
GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
GARY C. RIKARD, EXECUTIVE DIRECTOR

March 19, 2015

Ms. Beverly Bannister
Environmental Protection Agency
Region IV
Atlanta Federal Center
61 Forsyth Street
Atlanta, GA 30303-8960

RE: Mississippi Silicon

Dear Beverly,

Enclosed please find one portable hard drive which contains an electronic copy of air modeling regarding Mississippi Silicon, LLC (MS Silicon). MDEQ, pursuant to its primary permitting authority under its EPA approved SIP, issued a Prevention of Significant Determination (PSD) Permit to MS Silicon on November 27, 2013. Since that time, in response to certain Congressional inquiries, MDEQ has worked with EPA to provide responses to the questions which have been raised.

The attached response contains modeling files developed by MDEQ under contract with an independent third party to address the questions on the air quality analysis contained in the permit application. The most appropriate data available should always be selected for use in modeling analyses. Invariably, personal professional judgment will be required in the selection of the appropriate data sets used in the modeling. The additional modeling files are included not to imply that the air quality analysis included in the application was deficient, but solely to satisfy the inquiries related to the permit. The same conclusion is drawn from this modeling as with earlier models, i.e., the project permitted emissions will not cause or contribute to an exceedance of the NAAQS or PSD increments.

In addition to the information provided on the portable hard drive, MDEQ provides the following information in response to an email dated December 12, 2014, in which the Region 4 office of the U.S. Environmental Protection Agency provided additional comments regarding

MDEQ's September 4, 2014, response to the "MS Silicon Outstanding Air Quality Impact Assessment" questions provided in your correspondence to Maya Rao, Director, Air Division, dated July 16, 2014. EPA Region 4 also commented on MDEQ's response to questions involving plant roads, material handling and storage. Following is MDEQ's response to EPA Region 4 comments. EPA Region 4's original comment is restated in bold type followed by MDEQ's response in italics.

Plant roads, material handling and storage

Best management practices (BMP) are indicated as the methods for controlling emissions from bulldozing storage areas, vehicle road traffic, vehicle transport of raw product, and wind erosion from coal/wood/quartz/slag storage. Please provide a detailed technical justification for the selection of these unusually high control efficiencies for the BMPs which includes an explanation of how the control efficiencies will be reached.

MDEQ Response: *As stated in our September 4, 2014 response, BMP for the various fugitive type emission sources associated with the MS Silicon facility will utilize various practices including a) inclusion of 3-sided windscreen barriers (where technical feasible), b) use of chemical stabilization and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions. The fugitive dust control plan is to include such control techniques as controlling with water, dust suppressants, wind screens, vehicle speed reduction and vacuuming or sweeping of facility roads, as required. The control efficiency/technology information provided by MS Silicon was based on available guidance on what levels of control (and control efficiencies) can be reasonably anticipated for certain types of emission units and pollutants. This type of information was obtained from federal guidance documents, published literature, permitting agencies, as well as information and analysis discussed in technical reports such as the Western Regional Air Partnership (WRAP) Fugitive Dust Handbook*

(http://wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf). *The WRAP Fugitive Dust Handbook addressed:*

- *Factors affecting fugitive dust emissions*
- *The estimation of uncontrolled fugitive dust emissions*
- *Emission reductions achieved by control techniques for fugitive source categories such as the mineral products industry, materials handling operations, paved/unpaved haul roads, and material storage piles; and*
- *Incorporates available information from both the public (federal, state, and local air quality agencies) and private sectors that address options to reduce fugitive dust emissions.*

The methods for estimation of dust emissions rely primarily on EPA's AP-42 with references to alternative methods adopted by state and local control agencies. A list of fugitive dust control measures that have been implemented by jurisdictions designated by the U.S. EPA as nonattainment for federal PM_{10} standards are presented in the table below:

Source Category	*Control Measure*	*Published PM_{10} Control Efficiency*
Material Handling	*Implement wet suppression*	*50 – 90%*
	3-sided enclosure around storage piles	*75%*
	Covered storage pile with a tarp during high winds	*90%*
Paved Roads	*Sweeping*	*4 – 26%*
	Minimize trackout	*40 – 80%*
	Remove deposits from road as soon as permitted	*>90%*
Unpaved Roads	*Limit vehicle speed to 25 mph*	*44%*
	Apply water	*10 – 74%*
	Apply dust suppressant	*84%*
	Pave surface	*>90%*
Mineral Products Industry	*Cyclone*	*68 – 79%*
	Wet Scrubber	*78 – 98%*
	Fabric Filter	*99 – 99.8%*
	Electrostatic Precipitator	*90 – 99.5%*
Wind Erosion (agricultural, open area, and storage piles)	*Plant trees or shrubs as a wind break*	*25%*
	Create cross-wind ridges	*24 – 93%*
	Erect artificial wind barriers	*4 – 88%*
	Apply dust suppressant or gravel	*84%*
	Revegetate; apply cover crop	*90%*
	Watering	*90%*

To further clarify, the Dust Control Plan will identify the type and location of each fugitive dust source at the facility and describe all of the dust control measures to be implemented. This plan shall include the conditions when specific dust suppression activity will be implemented, the frequency of dust suppression activities, and the records (including, but not limited to, inspections, routine maintenance, list of routine scheduled dust suppression activity - watering, treating, cleaning, etc.) of those dust suppression activities. In the event of excessive dust emissions or spillage, immediate action/clean-up

will be required. After control measures are taken, a follow-up observation shall be performed to ensure the effectiveness of the control measures.

Records and any other supporting documents to demonstrate compliance with the Dust Control Plan must be maintained.

Once submitted, MDEQ will review and approve, conditionally approve, or disapprove the Dust Control Plan. A copy of the Plan will be retained on-site and be made available upon request by MDEQ personnel. The provisions and procedures of the Plan are subject to change should MDEQ find fugitive dust management practices do not meet requirements and/or permitted emission limits are not being met. Any revisions to the Dust Control Plan must be submitted to MDEQ for approval.

If you have any questions about this information or require additional information, please contact me at 601-961-5369.

Sincerely,

Donna J. Hodges
Senior Counsel

DJH:dac

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

DEC 17 2014

The Honorable Roger H. Bedford Jr.
Alabama Senate
P.O. Box 370
Russellville, Alabama 35653

Dear Mr. Bedford:

Thank you for your September 11, 2014, letter expressing your concerns regarding the ongoing construction of the Mississippi Silicon facility. You also wanted to know what action the U.S. Environmental Protection Agency would take and when we would take such action.

On September 10, 2014, our Air Permits Section received a response from the Mississippi Department of Environmental Quality (MDEQ) regarding the comments we made to them related to the air quality analysis that was completed for the proposed project. After our technical review of this information, we held teleconferences with Mississippi Silicon and MDEQ on October 16th and 21st. During these calls, we had meaningful discussions concerning issues related to the Company's air quality modeling and responses from MDEQ to address the EPA's comments on that modeling. We have also had additional discussions with our EPA Office of Air Quality Planning and Standards as part of our review. All of these calls have been productive and we are continuing to discuss our outstanding concerns. We have requested additional data and after reviewing all of this information, will be able to consider all of our options for taking any appropriate next steps.

If you have questions or need additional information from the EPA, please contact me or Heather Ceron, Chief of the Air Permits Section, at (404) 562-9185.

Sincerely,

V Anne Heard

for Heather McTeer Toney
Regional Administrator

cc: Jerry Beasley, MDEQ
Elliott Bickerstaff, MDEQ

Robinson, Donna

From: Jackson, Bill -FS <bjackson02@fs.fed.us>
Sent: Monday, October 28, 2013 11:30 AM
To: Bonnie_Morgan@deq.state.ms.us
Cc: Anderson, Bret A -FS; Pitrolo, Melanie -FS; Bond, Meredith <meredith_bond@fws.gov> (meredith_bond@fws.gov); Krivo, Stan
Subject: RE: FW: Initial response to the proposed MS Silicon, LCC permit

Hi Bonnie,

Here is a draft of what I am suggesting at this time, though my Agency may want to offer additional changes at a later date:

III.55: For Emission Point AA-201 (Submerged Arc Furnaces), the permittee can formally request removal of the restriction on the number of Submerged Arc Furnaces that can operate at any given time. To request elimination of this restriction, the permittee must submit a demonstration to the MDEQ, EPA, and the FLM that operation of 3 or 4 Submerged Arc Furnaces would not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS), or exceed the visibility thresholds or deposition analysis thresholds (DAT) for Sipsey Wilderness or Mingo National Wildlife Refuge (both are federally mandated Class I areas). The applicant will follow EPA's Appendix W requirements and the 2010 Federal Land Managers' Air Quality Related Values Workgroup (FLAG) document for conducting an air quality impact evaluation to Class II and Class I areas, respectively. Operation of 3 or 4 Submerged Arc Furnaces at any given time can only occur after formal approval from the MDEQ. Any request for elimination of this restriction must be provided by the permittee in writing to the MDEQ no later than 180 days prior to operation of the 3 or 4 Submerged Arc Furnaces simultaneously.
(Ref.: PSD Construction Permit Issued Issuance Date)

Thanks so much for the discussion on this topic.

Best regards,

Bill Jackson
Air Resource Specialist
USDA Forest Service
160A Zillicoa Street
Asheville, NC 28801

Email: bjackson02@fs.fed.us
Office phone #: 828-257-4815

-----Original Message-----
From: Bonnie_Morgan@deq.state.ms.us [mailto:Bonnie_Morgan@deq.state.ms.us]
Sent: Monday, October 28, 2013 10:36 AM
To: Jackson, Bill -FS

Cc: SteveFrey@KennedyJenks.com
Subject: Re: FW: Initial response to the proposed MS Silicon, LCC permit

Hi Bill, I understand why you had a strong reaction and that certainly wasn't my intent. I think I had an oversight when developing this condition. I should have inserted EPA and FLM review. How does this sound.
I've bolded the language that I thought might help. If you have any suggestions to this, please let me know. We can certainly discuss it further. Please forgive. Thanks!

III.55: For Emission Pint AA-201 (Submerged Arc Furnaces), the permittee can formally request removal of the restriction on the number of Submerged Arc Furnaces that can operate at any given time after approval from MDEQ, EPA and the FLM. To request elimination of this restriction, the permittee must submit a demonstration to the MDEQ, EPA, and FLM, that operation of the 4 Submerged Arc Furnaces would not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS) following EPA's Appendix W requirements for conducting an air quality impact evaluation.
Operation of 4 Submerged Arc Furnaces at any given time can only occur after formal approval from the MDEQ, EPA, and FLM. Any request for elimination of this restriction must be provided by the permittee in writing to the MDEQ, EPA, and FLM no later than 180 days prior to operation of the 4 Submerged Arc Furnaces simultaneously. (Ref.: PSD Construction Permit Issued Issuance Date)

Bonnie Grey Morgan
Metals and Metal Manufacturing Branch
Environmental Permits Division
Office of Pollution Control
Mississippi Department of Environmental Quality
(601) 961-5784
Physical Address: 515 Amite Street, Jackson, MS 39201 Mailing Address: P.O. Box 2261, Jackson, MS 39225

From:"Steve Frey" <SteveFrey@KennedyJenks.com> To:<Jacqueline_Evans@deq.state.ms.us>,
<Bonnie_Morgan@deq.state.ms.us>,
Date:10/25/2013 12:42 PM
Subject:FW: Initial response to the proposed MS Silicon, LCC permit

The intent of this condition was to include evaluation of both criteria air pollutants, as well as Class I visibility. The permit condition could be revised to reflect that situation. Also we do have results for four SAF which we could also share with the MDEQ and Class I manager. I did not want to cause any additional delays prior to the permit going to public notice.

Please let me know your thoughts

Steve

Steven Frey

Manager Air Quality

Kennedy/Jenks Consultants

1515 East Woodfield Road, Suite 360

Schaumburg, Illinois 60173

Office Phone: 847-278-7705

Email: stevefrey@kennedyjenks.com

From: Jackson, Bill -FS [mailto:bjackson02@fs.fed.us]
Sent: Friday, October 25, 2013 12:18 PM
To: Jacqueline_Evans@deq.state.ms.us
Cc: Anderson, Bret A -FS; Steve Frey; Krivo.Stanley@epamail.epa.gov; Thurmond, Dagmar -FS; Bond, Meredith <meredith_bond@fws.gov> (meredith_bond@fws.gov); Pitrolo, Melanie -FS
Subject: Initial response to the proposed MS Silicon, LCC permit

Dear Jackie,

We are making good progress on completing our review of the Class I atmospheric dispersion modeling analysis for the proposed Mississippi Silicon, LCC facility. To date, we have focused on the 2001 modeling results and have confirmed the input values for CALPUFF, POSTUTIL, and CALPOST do match the values in our Reviewer's Guide document. Our final step is to make sure the emission rates used in CALPUFF match those reported for the simultaneous operation of two Arc Furnaces.

We have also taken a look at the draft permit prepared by your agency and I am very concerned with item III.55 (page 18, and see at the bottom of this
email) and recommend that it be removed. As it is currently written, this permit condition could increase daily emissions without doing an adequate AQRV analysis for Sipsey Wilderness. It is my opinion that if this permit condition were implemented then it would circumvent the PSD process regarding protection for the Air Quality Related Values at Sipsey Wilderness and may result in an adverse impact if more than two of the Submerged Arc Furnaces are operated simultaneously.

If the permit condition (III.55) is not removed then I believe the current CALPUFF analysis should be modified with emissions occurring simultaneously from all four of the submerged Arc Furnaces. I look forward to this issue being resolved before we begin the technical briefing for the Federal Land Manager for Sipsey Wilderness. Please let me know if you would like to have a conference call with Bret Anderson and myself early next week to discuss this matter further.

Best regards,

Bill Jackson

Air Resource Specialist

USDA Forest Service

160A Zillicoa Street

Asheville, NC 28801

Email: bjackson02@fs.fed.us

Office phone #: 828-257-4815

III.55: For Emission Pint AA-201 (Submerged Arc Furnaces), the permittee can formally request removal of the restriction on the number of Submerged Arc Furnaces that can operate at any given time. To request elimination of this restriction, the permittee must submit a demonstration to the MDEQ that operation of the 4 Submerged Arc Furnaces would not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS) following EPA's Appendix W requirements for conducting an air quality impact evaluation. Operation of 4 Submerged Arc Furnaces at any given time can only occur after formal approval from the MDEQ. Any request for elimination of this restriction must be provided by the permittee in writing to the MDEQ no later than 180 days prior to operation of the 4 Submerged Arc Furnaces simultaneously. (Ref.: PSD Construction Permit Issued Issuance Date)

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MS Silicon Call w/United Steel Workers (USW) representatives

March 4, 2014, 11:30 am – 12:15 pm

EPA Participants:
Beverly Banister (by phone)
Jeaneanne Gettle
Scott Davis
Heather Ceron
Katy Lusky
Brenda Johnson
Stan Krivo
John Calcagni (by phone)
Eric Triplett

USW Participants:
Roxanne Brown (USW)
Diane Heminway (USW)
Joe Santarella (Attorney)
Susan Eckert (Attorney)
Walter Koucky (Consultant)
Mike Wright (USW)

Summary of Concerns from USW/Attorneys/Consultant:
USW (Roxanne) is representing the concerns of clients from a competing facility located near Selma, Alabama (Globe Metallurgical, Inc).

Roxanne (USW) highlighted the main concerns with the MS Silicon project as:
1. Potential environmental impacts in the surrounding community and neighboring states
2. Unfair competitive advantage b/c of poor permitting by MDEQ
3. The bulk of EPA submitted comments (*e.g.,* BACT, modeling, etc.) were not addressed by the state
4. MDEQ's failure to respond to comments could lead to national permitting procedure issues

Joe (Attorney) detailed some of their concerns (based on very limited review time): (1) in general, the bulk of EPA's comments were not addressed on BACT analysis (sets a significant negative precedent for BACT), modeling, potential to emit, and practical enforcement; and (2) with the MS DEQ's public notice procedures (*i.e.,* "deliberate" pattern by MDEQ to not follow procedures), including:
1. Failure to publish public notice in paper located within project area (location of paper for public notice was too far (60 miles) from affected area), 3 other newspapers within Tishomingo County, MS not used
2. Failure to provide a full 30 day public comment period
3. Failure to make all documents available to the public in a timely, reasonable and accessible manner
4. Public library was located too far from affected area/location
5. Failed to provide opportunity for public to request a public hearing
6. Public notice couldn't identify opportunity for public hearing due to paper location (#1 above).

Walter (Consultant) detailed some of their preliminary technical concerns (based on very limited review time) with the MS Silicon Permit:
1. Permit production limits (84,000 TPY of product) are inconsistent with manufacturer's information USW collected on the annual capacity of each furnace (their manufacturer information relayed is 2 furnaces have 33,000 TPY capacity total)
2. Permit limits operation to only 2 furnaces at one time, but emissions (TPY) and production limits are based on 4 furnaces. Concerns with the ability to remove the above 2 furnace operating limitation from the permit. Called this "classic sham permitting" as it was inconsistent with the physical capacity of the facility.
3. Applicant didn't take into account "secondary" GHG emissions that would have occurred at the offsite power plant, if electricity is purchased to power furnaces.
4. Identified many of the same technical concerns that EPA included as comments in our various letters to MDEQ such as: eliminating controls as technically infeasible when cost was the underlying issue, rejection of waste heat recovery to reduce GHG emissions, etc…

MS Silicon Call w/United Steel Workers (USW) representatives

March 4, 2014, 11:30 am – 12:15 pm

5. Identified BACT concerns with $PM_{2.5}$ analysis and concerns with the lack of condensable and precursor consideration.
6. Indicated modeling was deficient based on what they have reviewed (failure to consider emissions properly leads to deficient modeling). Failed to look at or address HCl emissions and condensable/secondary $PM_{2.5}$.

Joe (Attorney) - Conclusions:
USW requests that EPA re-open the public notice and comment period for MS Silicon (per 40 CFR part 124.14).

After hearing their concerns, Jeaneanne indicated EPA would take their comments under consideration and discuss the situation with MDEQ and decide on a path forward.

USW will forward more comprehensive written comments (via email) to EPA as soon as their consultant (Walter) has had a chance to fully review the permit and supporting information for the project.

EPA provided USW with the email contact information for Jeaneanne Gettle, Scott Davis, and Heather Ceron. EPA also committed to USW's request to re-convene on another call after we have had an opportunity to review their concerns.

Krivo, Stan

From: Krivo, Stan
Sent: Wednesday, December 10, 2014 11:19 AM
To: Davis, Scott
Subject: FW: MS Silicon - Remaining Air Quality Modeling Issues

Categories: Record Saved - Shared

Scott,

This is a follow up to our discussion and for use in discussions with Beverly.
...sjk

Stanley Krivo, CCM, QEP
U.S. Environmental Protection Agency
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960
Phone: 404/562-9123
Fax: 404/562-9019

From: Krivo, Stan
Sent: Wednesday, December 10, 2014 7:51 AM
To: Jacqueline Evans
Subject: FW: MS Silicon - Remaining Air Quality Modeling Issues

Second Attempt

Stanley Krivo, CCM, QEP
U.S. Environmental Protection Agency
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960
Phone: 404/562-9123
Fax: 404/562-9019

From: Krivo, Stan
Sent: Wednesday, December 10, 2014 7:49 AM
To: Jacqueline Evans - MS DEQ (Business Fax)
Subject: MS Silicon - Remaining Air Quality Modeling Issues

Jackie,

The following provides a follow up to Monday's (8 December) conference call on the MS Silicon remaining outstanding air quality impact assessment issues. This is provided to help clarify some of the concerns discussed in our call.

Our below comments, which following the original issues and questions provided in EPA's 14 July 2014 letter, summarizes our evaluation of MDEQ provided responses. Some of the original issues/concerns have been resolved (Identified by asterisk) but others remain unresolved.

I hope this helps in your effort to address the remaining concerns with the air quality modeling for the MS Silicon permit. Thanks...sjk

---

EPA's Review Comments on MDEQ's 4 September 2014 Responses to MS Silicon Outstanding Air Quality Impact Assessment Questions from EPA

1) Exclusion of Fugitive and Volume Emission Sources

According to the November 22, 2013 "Addendum #2 Updated Air Quality Impact Evaluation (Criteria Air Pollutants)," MS Silicon eliminated fugitive emission and volume source emissions because it concluded that their maximum impacts will be close to or within the facilities property boundary. To allow assessment of the appropriateness of this elimination, MS Silicon must provide supporting quantitative information on the number, location, and magnitude of the emissions excluded from the cumulative air quality assessment (*e.g.,* inventory of the eliminate fugitive and volume sources).

EPA Comments

- MDEQ's response only addresses the fugitive and volume emission sources for the project (i.e., MS Silicon). This question concerns the other nearby sources included in the cumulative impact assessment.

2) Use of Actual Emissions

The MS Silicon modeling used allowable emissions **except for** the modeling relating to compliance with the one hour SO_2 NAAQS and the one hour NO_2 NAAQS in the November 2013 "Addendum #2 where actual emissions were used. The use of actual emissions in the cumulative NAAQS compliance modeling is not supported by past or current practice nor by 40 CFR Part 51, Appendix W. Please provide a detailed technical explanation why this modelling approach was accepted by MDEQ as appropriate and in accordance with the current regulations, guidance, and accepted practice.

EPA Comments

The following provides our issues with MDEQ's use of the following references as technical explanations why the use of actual emissions was an acceptable and appropriate procedure in accordance with current regulations, guidance, and accepted practice.

- Use the March 1989 Calcagni Memorandum
    - Appendix W regulations and guidance has been updated a number of times since 1989. Appendix W contains the current acceptable models and modeling procedures for air quality impact analyses supporting PSD permit applications. Calcagni's guidance would have been incorporated in Appendix W updates if applicable.
    - Calcagni's reference to the 1980 PSD Workshop Manual is superseded by the 1990 version
    - This memorandum contains specific requirements/limitations for appropriate use of actual emissions (i.e., Only applicable for annual and quarterly NAAQS and only with respect to annual operating factor, historical operating levels and/or operating factors will be representative of future conditions.). The appropriateness of these conditions have not been addressed or demonstrated.
    - The justification provided in the PSD permit application for use of actual emissions did not reference this memo.
    - There were no commitments from MEEQ or the applicant concerning the modeled actual emissions being representative of future emissions, to become future allowable emissions, or any commitments concerning the actual modeled emissions.

    - Modeled actual 1-hour actual emissions appear to be developed from a database having only actual annual TPY values. Therefore, the values modeled are not appropriate maximum hourly rates reflective of actual emission from the past 2-years of operation.
- EPA 05/01/11 Clarification Memorandum
    - Applicant determined the appropriate other nearby emission source to include in the cumulative modeling analysis. This Clarification Memorandum guidance concerning the use of professional judgment in the selection of other emission sources was available so it must have been considered in the selection of other emission source.
    - This referenced memorandum is not applicable to justify the use of actual emissions.
    - The applicant did not reference this memorandum in the PSD permit application.
- Appendix W Table 8-1
    - The appropriate input emissions must take into consideration the NAAQS of concern; maximum daily 1-hour concentrations.
    - The footnote to Table 8-1 indicates this table provides input data requirements for SIP. Other input criteria may apply to new source review or PSD.
    - Table 8-2 title is "Point Source Model Emission Input Data for NAAQS Compliance in PSD Demonstrations." Section 8.1.2(i) states that Table 8-2 "NAAQS compliance demonstrations in PSD analysis should follow the emissions input data shown in Table 8-2". This table also contains a category of "Other Sources".
    - Modeled 1-hour actual emissions, developed from a database having only actual annual TPY values are not appropriate maximum hourly rates reflective of actual emission from the past 2-years operation.

3) Modeled Receptor Grid

Please confirm that all modeled controlling concentrations and/or concentration exceeding ambient standards, and concentrations challenging these concentrations (*e.g.,* greater than 90% of the values), have been modeled with 100-meter grid resolution. If this was not the case, please provide information showing the actual grid resolution and explain why this grid resolution is appropriate. Also, please provide an explanation of why the 100-meter grid resolution was not used and discuss any potential differences in outcome from the use of a different grid.

<u>EPA Comments</u>

- Based on technical judgment and previous modeling guidance, the receptor grid resolution that ensures the identification of the estimated highest concentration and/or all modeled NAASQ exceedances is one of 100-meters spacing. Therefore, either all modeling grids have resolutions of 100-m spacing or all maximum modeled impacts or those with concentrations challenging these concentrations (i.e. within 10% of the maximum concentration) should be modeled within grids of 100-m spacing.
- The response does not clearly indicate challenging concentrations in grids of larger spacing were considered in the modeled grid resolutions.

4) Plant roads, material handling and storage

Best management practice (BMP) are indicated as the method for controlling emissions from bulldozing storage areas, vehicle road traffic, vehicle transport of raw product, and wind erosion from coal/wood/quarts/slag storage. Please provide a detailed technical justification for the selection of these unusually high control efficiencies for the BMPs which includes an explanation of how the control efficiencies will be reached.

<u>EPA Comments</u>

- The selected control efficiencies for these MS Silicon emission sources were at or above the highest provided in the published data – the reason for this question. Just stating good management practices is not sufficient justification for these high control efficiencies. The reason the highest control efficiencies are appropriate should be provided.

5) *$PM_{2.5}$ Impact Analysis

Please provide the technical basis for the assumption that the baghouse will capture a majority of the secondary $PM_{2.5}$ emissions (*i.e.,* nitrates and sulfates). Please note, that appropriate guidance for this evaluation is the "Guidance for $PM_{2.5}$ Permit Modeling", finalized in 2014. EPA does not believe that relying on EPA's 2010 $PM_{2.5}$ guidance for the assessment of secondary $PM_{2.5}$ emissions is appropriate. These are important considerations given the large project SO_2 and NO_2 emissions and a resulting $PM_{2.5}$ controlling concentration within 6% of the NAAQS concentration considering only direct emissions.

EPA Comments

- The responses to this question do not address the PSD application provided justification for not addressing secondary PM2.5 emissions: the assumption that the baghouse will capture a majority of the secondary emissions.
- The MDEQ provided 5 alternate analyses to supporting the fact that no secondary PM2.5 assessment was provided in the PSD permit application. The information provided in these alternate analyses contained in MDEQ's response may be sufficient to replace the provided assumption that the baghouse would capture these emissions. These supporting analyses were not provided in the application or MDEQ's Preliminary Determination for this permit application.

6) Two-Prong Culpability Contribution Analysis

To address the project's contribution to modeled NAAQS violations, a unique, two-prong procedure was used. The first prong consisted of modeling the project's impacts along a straight line from the project to the nearby source assumed to cause the violation. It was assumed that the maximum interaction between these sources would occur along the straight line path downwind of the other source with no consideration of real atmospheric conditions where plumes interact. The second prong, which is also addressed above in comment #2, is a cumulative NAAQS compliance assessment performed using actual emissions, rather than permit allowable emissions, for the facilities contributing most to the modeled violations. Please provide the technical basis for accepting this two-prong culpability approach used to demonstrate no significant project impact to all modeled NAAQS exceedances.

EPA Comments

- The second prong of the PSD application two-pong culpability analysis deals with the previous question on the use of actual emissions rather than allowables.
    - The actual maximum 1-hour emissions occurring during the most recent 2 years should be used. The 1-hour values modeled appear to have been developed from an actual tons per year database which would not yield maximum actual 1-hour emissions.
    - The use of "actual" SO_2 hourly emissions for the TVA Colbert facility in AL resolved all 1-hour SO_2 modeled NAAQS exceedances. Therefore, there were no modeled NAAQS violations so MS Silicon could not contribute to a modeled NAAQS exceedance.
    - Although the TVA Colbert facility's emissions are being reduced under some form of enforcement actions, the MS Silicon permit does not make some enforceable commitment for the plant's operation contingent on the Colbert plant's future emission rate or other operation.

- Each source's modeled actual emissions should be those associated with future plant's operations. An enforceable permit commitment by these plants to the modeled emissions would make the use of current actual maximum 1-hour emissions acceptable.

- The first prong assesses the project's impact in a limited scenario of direct line (constant wind direction), center line plume concentrations downwind of a nearby emission source that is assumed to cause the modeled NAAQS exceedance.
  - Step 1 of this assessment just provides the maximum project ambient1-hour SO_2 and NO_2 concentrations compared to the NAAQS. This just demonstrates the project's emissions will not in themselves exceed the 1-hour NAAQS.
  - Step 2 compared the project's impact to the SIL. The significant impact area for the project 1-hour SO_2 and NO_2 concentrations was 50 kilometers.
  - Step 3 was the evaluation of the cumulative impacts from SO_2 and NO_2 emission sources including MS Silicon and nearby sources. This resulted in maximum 1-hour SO_2 and NO_2 concentrations much larger than the 1-hour NAAQS.
  - Use of "actual" 1-hour SO_2 emissions for the TVA Colbert plant resolved the SO_2 problem.
  - "Actual" 1-hour NO_2 emissions were used for both TVA Colbert and Columbia Gas Transmission plants with the operation of MS Silicon limited to 2 SAF units. In addition, the Tier 2 conversion factor (0.8) was also used. Modeling with these limitation still produced modeled 1-hour NO_2 NAAQS exceedances. An analysis determining the maximum concentration of two interacting sources was performed by placing receptors downwind of a source along a diagonal line between MS Silicon and the source. This is not a definitive assessment of MS Silicon's contribution to modeled exceedances unless all receptors with modeled exceedances are "downwind" of this source in this same direction.
  - The final modeling using MAXCOUNT option would be a definitive method of determining MS Silicon's contribution to all modeled violations. The input configuration for this run should be given (e.g., the emission sources, emission rates, conversion factor, receptor grid used, etc.). [Note: Need to show that the project will not have a significant contribution to any modeled violation. Modeling should be performed including the final configuration of all emission sources (e.g., with actual emissions, etc.) including all receptors with 100-m resolution in area with modeled violations.]

7) Modeling Procedure for 1-Hour NO_2

The use of actual emissions (*see* EPA questions 2 and 6, above) for the two significant nearby facilities reduced the number of modeled NO_2 violations but MS Silicon significantly contributed to some of the remaining modeled violations. The applicant used an 8 step process to resolve MS Silicon's contribution to the modeled NO_2 violations but only for "critical" receptors, as described in the application. This process does not address significant contribution by MS Silicon to all model concentrations exceeding the NAAQS. Please provide the technical basis for the conclusion that there are no significant project contributions to any modelled concentration exceeding the NAAQS.

<u>EPA Comments</u>

- The response to this question referred to question 6. Therefore the comments associated with Question 6 are applicable to this question.

8) *Impacts to Soils and Vegetation

Given the modeled NAAQS violations for the 1-hour SO_2 and NO_2, the statement in Section 4.2 that the maximum predicted NO_2 ambient concentrations are below the ambient air quality standards is unsupported and inappropriate. The results of the NAAQS compliance modeling (*i.e.,* cumulative

impacts) should be used for comparison to the target values in Tables 4-1. Please provide the technical basis for accepting the applicant's assessment of soils and vegetation impacts.

EPA Comments

- The provided response would answers this question if TVA Colbert SO_2 modeled emissions become enforceable.

9) * PSD Class II Visibility Assessment

The applicant did not include a visibility impairment assessment of the project's impact in the PSD Class II area (*i.e.,* project's impact area). Please provide the technical basis for the conclusion that this analysis was not needed for this project.

EPA Comments

- The provided response answers this question – no state or federal parks or airports within the significant impact area [Note: Visibility assessment VISCREEN should be based on maximum hourly emissions.]

10) * PSD Class I Area SIL Assessment

MS Silicon's PSD Class I area (Sipsey) SO_2 impact assessment was greater than the SIL. A cumulative impact assessment was not performed based on the applicant's statement that it was not aware of any other significant PSD increment consuming SO_2 source that would impact Sipsey. The basis for this statement was not provided. Please provide the steps taken to identify other significant PSD increment consuming SO_2 sources that could impact the Sipsey Wilderness Area. If sources are indeed identified, please provide a cumulative impact assessment or the technical basis for why an assessment is not needed.

EPA Comments

- The Alabama DEM 2010 assessment of the SO_2 increment consumption at Sipsey was provided to demonstrate that the PSD Class I increment will not be exceeded based on the estimated project impacts.
- If the 2010 Alabama DEM study is shown to be still applicable (i.e., no additional increment consumption since 2010), than the provided additional information would be acceptable.

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Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960
Phone: 404/562-9123
Fax: 404/562-9019

12/12/14
Email to Jackie Evens MDEQ on 12/10/14

Second Attempt

Stanley Krivo, CCM, QEP
U.S. Environmental Protection Agency
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960
Phone: 404/562-9123
Fax: 404/562-9019

From: Krivo, Stan
Sent: Wednesday, December 10, 2014 7:49 AM
To: Jacqueline Evans - MS DEQ (Business Fax)
Subject: MS Silicon - Remaining Air Quality Modeling Issues

Jackie,

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Our below comments, which following the original issues and questions provided in EPA's 14 July 2014 letter, summarizes our evaluation of MDEQ provided responses. Some of the original issues/concerns have been resolved (Identified by asterisk) but others remain unresolved.

I hope this helps in your effort to address the remaining concerns with the air quality modeling for the MS Silicon permit.
Thanks...sjk

EPA's Review Comments on MDEQ's 4 September 2014 Responses to MS Silicon Outstanding Air Quality Impact Assessment Questions from EPA

1) Exclusion of Fugitive and Volume Emission Sources

According to the November 22, 2013 "Addendum #2 Updated Air Quality Impact Evaluation (Criteria Air Pollutants)," MS Silicon eliminated fugitive emission and volume source emissions because it concluded that their maximum impacts will be close to or within the facilities property boundary. To allow assessment of the appropriateness of this elimination, MS Silicon must provide supporting quantitative information on the number, location, and magnitude of the emissions excluded from the cumulative air quality assessment (*e.g.,* inventory of the eliminate fugitive and volume sources).

EPA Comments

- MDEQ's response only addresses the fugitive and volume emission sources for the project (i.e., MS Silicon). This question concerns the other nearby sources included in the cumulative impact assessment.

2) Use of Actual Emissions

The MS Silicon modeling used allowable emissions **except for** the modeling relating to compliance with the one hour SO_2 NAAQS and the one hour NO_2 NAAQS in the November 2013 "Addendum #2 where actual emissions were used. The use of actual emissions in the cumulative NAAQS compliance modeling is not supported by past or current practice nor by 40 CFR Part 51, Appendix W. Please provide a detailed technical explanation why this modelling approach was accepted by MDEQ as appropriate and in accordance with the current regulations, guidance, and accepted practice.

EPA Comments

The following provides our issues with MDEQ's use of the following references as technical explanations why the use of actual emissions was an acceptable and appropriate procedure in accordance with current regulations, guidance, and accepted practice.

- Use the March 1989 Calcagni Memorandum
    - Appendix W regulations and guidance has been updated a number of times since 1989. Appendix W contains the current acceptable models and modeling procedures for air quality impact analyses supporting PSD permit applications. Calcagni's guidance would have been incorporated in Appendix W updates if applicable.
    - Calcagni's reference to the 1980 PSD Workshop Manual is superseded by the 1990 version
    - This memorandum contains specific requirements/limitations for appropriate use of actual emissions (i.e., Only applicable for annual and quarterly NAAQS and only with respect to annual operating factor, historical operating levels and/or operating factors will be representative of future conditions.). The appropriateness of these conditions have not been addressed or demonstrated.
    - The justification provided in the PSD permit application for use of actual emissions did not reference this memo.
    - There were no commitments from MEEQ or the applicant concerning the modeled actual emissions being representative of future emissions, to become future allowable emissions, or any commitments concerning the actual modeled emissions.
    - Modeled actual 1-hour actual emissions appear to be developed from a database having only actual annual TPY values. Therefore, the values modeled are not appropriate maximum hourly rates reflective of actual emission from the past 2-years of operation.
- EPA 05/01/11 Clarification Memorandum
    - Applicant determined the appropriate other nearby emission source to include in the cumulative modeling analysis. This Clarification Memorandum guidance concerning the use of professional judgment in the selection of other

emission sources was available so it must have been considered in the selection of other emission source.
    - This referenced memorandum is not applicable to justify the use of actual emissions.
    - The applicant did not reference this memorandum in the PSD permit application.
- Appendix W Table 8-1
    - The appropriate input emissions must take into consideration the NAAQS of concern; maximum daily 1-hour concentrations.
    - The footnote to Table 8-1 indicates this table provides input data requirements for SIP. Other input criteria may apply to new source review or PSD.
    - Table 8-2 title is "Point Source Model Emission Input Data for NAAQS Compliance in PSD Demonstrations." Section 8.1.2(i) states that Table 8-2 "NAAQS compliance demonstrations in PSD analysis should follow the emissions input data shown in Table 8-2". This table also contains a category of "Other Sources".
    - Modeled 1-hour actual emissions, developed from a database having only actual annual TPY values are not appropriate maximum hourly rates reflective of actual emission from the past 2-years operation.

3) Modeled Receptor Grid

Please confirm that all modeled controlling concentrations and/or concentration exceeding ambient standards, and concentrations challenging these concentrations (*e.g.*, greater than 90% of the values), have been modeled with 100-meter grid resolution. If this was not the case, please provide information showing the actual grid resolution and explain why this grid resolution is appropriate. Also, please provide an explanation of why the 100-meter grid resolution was not used and discuss any potential differences in outcome from the use of a different grid.

EPA Comments

- Based on technical judgment and previous modeling guidance, the receptor grid resolution that ensures the identification of the estimated highest concentration and/or all modeled NAASQ exceedances is one of 100-meters spacing. Therefore, either all modeling grids have resolutions of 100-m spacing or all maximum modeled impacts or those with concentrations challenging these concentrations (i.e. within 10% of the maximum concentration) should be modeled within grids of 100-m spacing.
- The response does not clearly indicate challenging concentrations in grids of larger spacing were considered in the modeled grid resolutions.

4) Plant roads, material handling and storage

Best management practice (BMP) are indicated as the method for controlling emissions from bulldozing storage areas, vehicle road traffic, vehicle transport of raw product, and wind erosion from coal/wood/quarts/slag storage. Please provide a detailed technical

justification for the selection of these unusually high control efficiencies for the BMPs which includes an explanation of how the control efficiencies will be reached.

EPA Comments

- The selected control efficiencies for these MS Silicon emission sources were at or above the highest provided in the published data – the reason for this question. Just stating good management practices is not sufficient justification for these high control efficiencies. The reason the highest control efficiencies are appropriate should be provided.

5) *$PM_{2.5}$ Impact Analysis

Please provide the technical basis for the assumption that the baghouse will capture a majority of the secondary $PM_{2.5}$ emissions (*i.e.,* nitrates and sulfates). Please note, that appropriate guidance for this evaluation is the "Guidance for $PM_{2.5}$ Permit Modeling", finalized in 2014. EPA does not believe that relying on EPA's 2010 $PM_{2.5}$ guidance for the assessment of secondary $PM_{2.5}$ emissions is appropriate. These are important considerations given the large project SO_2 and NO_2 emissions and a resulting $PM_{2.5}$ controlling concentration within 6% of the NAAQS concentration considering only direct emissions.

EPA Comments

- The responses to this question do not address the PSD application provided justification for not addressing secondary PM2.5 emissions: the assumption that the baghouse will capture a majority of the secondary emissions.
- The MDEQ provided 5 alternate analyses to supporting the fact that no secondary PM2.5 assessment was provided in the PSD permit application. The information provided in these alternate analyses contained in MDEQ's response may be sufficient to replace the provided assumption that the baghouse would capture these emissions. These supporting analyses were not provided in the application or MDEQ's Preliminary Determination for this permit application.

6) Two-Prong Culpability Contribution Analysis

To address the project's contribution to modeled NAAQS violations, a unique, two-prong procedure was used. The first prong consisted of modeling the project's impacts along a straight line from the project to the nearby source assumed to cause the violation. It was assumed that the maximum interaction between these sources would occur along the straight line path downwind of the other source with no consideration of real atmospheric conditions where plumes interact. The second prong, which is also addressed above in comment #2, is a cumulative NAAQS compliance assessment performed using actual emissions, rather than permit allowable emissions, for the facilities contributing most to the modeled violations. Please provide the technical basis for accepting this two-prong culpability approach used to demonstrate no significant project impact to all modeled NAAQS exceedances.

EPA Comments

- The second prong of the PSD application two-pong culpability analysis deals with the previous question on the use of actual emissions rather than allowables.
    - The actual maximum 1-hour emissions occurring during the most recent 2 years should be used. The 1-hour values modeled appear to have been developed from an actual tons per year database which would not yield maximum actual 1-hour emissions.
    - The use of "actual" SO_2 hourly emissions for the TVA Colbert facility in AL resolved all 1-hour SO_2 modeled NAAQS exceedances. Therefore, there were no modeled NAAQS violations so MS Silicon could not contribute to a modeled NAAQS exceedance.
    - Although the TVA Colbert facility's emissions are being reduced under some form of enforcement actions, the MS Silicon permit does not make some enforceable commitment for the plant's operation contingent on the Colbert plant's future emission rate or other operation.
    - Each source's modeled actual emissions should be those associated with future plant's operations. An enforceable permit commitment by these plants to the modeled emissions would make the use of current actual maximum 1-hour emissions acceptable.
- The first prong assesses the project's impact in a limited scenario of direct line (constant wind direction), center line plume concentrations downwind of a nearby emission source that is assumed to cause the modeled NAAQS exceedance.
    - Step 1 of this assessment just provides the maximum project ambient1-hour SO_2 and NO_2 concentrations compared to the NAAQS. This just demonstrates the project's emissions will not in themselves exceed the 1-hour NAAQS.
    - Step 2 compared the project's impact to the SIL. The significant impact area for the project 1-hour SO_2 and NO_2 concentrations was 50 kilometers.
    - Step 3 was the evaluation of the cumulative impacts from SO_2 and NO_2 emission sources including MS Silicon and nearby sources. This resulted in maximum 1-hour SO_2 and NO_2 concentrations much larger than the 1-hour NAAQS.
    - Use of "actual" 1-hour SO_2 emissions for the TVA Colbert plant resolved the SO_2 problem.
    - "Actual" 1-hour NO_2 emissions were used for both TVA Colbert and Columbia Gas Transmission plants with the operation of MS Silicon limited to 2 SAF units. In addition, the Tier 2 conversion factor (0.8) was also used. Modeling with these limitation still produced modeled 1-hour NO_2 NAAQS exceedances. An analysis determining the maximum concentration of two interacting sources was performed by placing receptors downwind of a source along a diagonal line between MS Silicon and the source. This is not a definitive assessment of MS Silicon's contribution to modeled exceedances unless all receptors with modeled exceedances are "downwind" of this source in this same direction.
    - The final modeling using MAXCOUNT option would be a definitive method of determining MS Silicon's contribution to all modeled violations. The input configuration for this run should be given (e.g., the emission sources,

emission rates, conversion factor, receptor grid used, etc.). [Note: Need to show that the project will not have a significant contribution to any modeled violation. Modeling should be performed including the final configuration of all emission sources (e.g., with actual emissions, etc.) including all receptors with 100-m resolution in area with modeled violations.]

7) Modeling Procedure for 1-Hour NO_2

The use of actual emissions (*see* EPA questions 2 and 6, above) for the two significant nearby facilities reduced the number of modeled NO_2 violations but MS Silicon significantly contributed to some of the remaining modeled violations. The applicant used an 8 step process to resolve MS Silicon's contribution to the modeled NO_2 violations but only for "critical" receptors, as described in the application. This process does not address significant contribution by MS Silicon to all model concentrations exceeding the NAAQS. Please provide the technical basis for the conclusion that there are no significant project contributions to any modelled concentration exceeding the NAAQS.

EPA Comments

- The response to this question referred to question 6. Therefore the comments associated with Question 6 are applicable to this question.

8) *Impacts to Soils and Vegetation

Given the modeled NAAQS violations for the 1-hour SO_2 and NO_2, the statement in Section 4.2 that the maximum predicted NO_2 ambient concentrations are below the ambient air quality standards is unsupported and inappropriate. The results of the NAAQS compliance modeling (*i.e.*, cumulative impacts) should be used for comparison to the target values in Tables 4-1. Please provide the technical basis for accepting the applicant's assessment of soils and vegetation impacts.

EPA Comments

- The provided response would answers this question if TVA Colbert SO_2 modeled emissions become enforceable.

9) * PSD Class II Visibility Assessment

The applicant did not include a visibility impairment assessment of the project's impact in the PSD Class II area (*i.e.*, project's impact area). Please provide the technical basis for the conclusion that this analysis was not needed for this project.

EPA Comments

- The provided response answers this question – no state or federal parks or airports within the significant impact area [Note: Visibility assessment VISCREEN should be based on maximum hourly emissions.]

10) * PSD Class I Area SIL Assessment

MS Silicon's PSD Class I area (Sipsey) SO_2 impact assessment was greater than the SIL. A cumulative impact assessment was not performed based on the applicant's statement that it was not aware of any other significant PSD increment consuming SO_2 source that would impact Sipsey. The basis for this statement was not provided. Please provide the steps taken to identify other significant PSD increment consuming SO_2 sources that could impact the Sipsey Wilderness Area. If sources are indeed identified, please provide a cumulative impact assessment or the technical basis for why an assessment is not needed.

EPA Comments

- The Alabama DEM 2010 assessment of the SO_2 increment consumption at Sipsey was provided to demonstrate that the PSD Class I increment will not be exceeded based on the estimated project impacts.
- If the 2010 Alabama DEM study is shown to be still applicable (i.e., no additional increment consumption since 2010), than the provided additional information would be acceptable.

Stanley Krivo, CCM, QEP
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Atlanta Federal Center
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Phone: 404/562-9123
Fax: 404/562-9019

Robinson, Donna

From: Krivo, Stan
Sent: Thursday, January 15, 2015 9:21 AM
To: Jacqueline Evans
Cc: Lusky, Katy
Subject: Discussions - New MDEQ AQ Modeling of MS Silicon

Categories: Record Saved - Shared

Jackie,

This is a follow up to our Mississippi Silicon discussions last week (7 & 8 January 2015). These discussions of MDEQ's planned new impact modeling assessment of MS Silicon approved emissions were very helpful. The planned new impacts assessment for this project appear to use current regulatory accepted procedures and techniques, and is designed to resolve the remaining outstanding modeling issues as provided in my 12 December 2014 email. One of my tasks resulting from these discussions was to review the 12 December 2014 email to ensure the MDEQ planned impact modeling effort will resolve all outstanding issues.

The following provides the original issue/question from my email following by my understanding of how each issue/question will be resolved in the new MDEQ modeling. Based on our discussions, the only items/questions that may not be fully resolved are numbers 1, 2, and 4.

I hope this helps in your effort to address the remaining concerns with the new air quality modeling of the MS Silicon facility.
Please let me know of any questions.
Thanks...sjk

EPA's Review Comments on MDEQ's 4 September 2014 Responses to MS Silicon Outstanding Air Quality Impact Assessment Questions from EPA

1) Exclusion of Fugitive and Volume Emission Sources

According to the November 22, 2013 "Addendum #2 Updated Air Quality Impact Evaluation (Criteria Air Pollutants)," MS Silicon eliminated fugitive emission and volume source emissions because it concluded that their maximum impacts will be close to or within the facilities property boundary. To allow assessment of the appropriateness of this elimination, MS Silicon must provide supporting quantitative information on the number, location, and magnitude of the emissions excluded from the cumulative air quality assessment (*e.g.*, inventory of the eliminate fugitive and volume sources).

Partially Addressed
- MDEQ's will include fugitive and volume emissions for all nearby emission sources located within the significant impact area (SIA). The modeled emission inventory will also include minor emission sources within the SIA.
- The requested information on the number, location, and magnitude of these emissions excluded from the cumulative air quality assessment (e.g., inventory of eliminated fugitive and volume sources) was not addressed.

2) Use of Actual Emissions

The MS Silicon modeling used allowable emissions **except for** the modeling relating to compliance with the one hour SO_2 NAAQS and the one hour NO_2 NAAQS in the November 2013 "Addendum #2 where actual emissions were used. The use of actual emissions in the cumulative NAAQS compliance modeling is not supported by past or current practice nor by 40 CFR Part 51, Appendix W. Please provide a detailed technical explanation why this modelling approach was accepted by MDEQ as appropriate and in accordance with the current regulations, guidance, and accepted practice.

Partially Addressed
- All emissions to be used in the new impact assessment will be permit allowable or maximum potential emissions for each emission unit. No actual emissions will be used in this modeling effort.
- Modeled 1-hourly emissions developed from emission records containing only annual TPY values needs to be addressed. Modeled hourly emission rates developed from annual TPY values are generally not appropriate maximum allowable or potential hourly emissions.

3) Modeled Receptor Grid

Please confirm that all modeled controlling concentrations and/or concentration exceeding ambient standards, and concentrations challenging these concentrations (*e.g.,* greater than 90% of the values), have been modeled with 100-meter grid resolution. If this was not the case, please provide information showing the actual grid resolution and explain why this grid resolution is appropriate. Also, please provide an explanation of why the 100-meter grid resolution was not used and discuss any potential differences in outcome from the use of a different grid.

Addressed
- The new MDEQ modeling will include significant impact level (SIL) assessment that will be performed with the receptor grids used for the impact modeling provided in the PSD permit application. MDEQ will select receptors where the MS Silicon project impacts equal or exceed 90% of the applicable SIL for the cumulative NAAQS compliance assessment.
- All cumulative compliance modeled receptors with concentrations equal or greater than 90% of the applicable NAAQS will be modeled with a receptor grid of 100-m resolution. Re-modeling with more refined receptor grids will be performed, as necessary.

4) Plant roads, material handling and storage

Best management practice (BMP) are indicated as the method for controlling emissions from bulldozing storage areas, vehicle road traffic, vehicle transport of raw product, and wind erosion from coal/wood/quarts/slag storage. Please provide a detailed technical justification for the selection of these unusually high control efficiencies for the BMPs which includes an explanation of how the control efficiencies will be reached.

Not Addressed
This issue was not discussed in our conference call discussions of the new MDEQ modeling effort.

5) $PM_{2.5}$ Impact Analysis

Please provide the technical basis for the assumption that the baghouse will capture a majority of the secondary $PM_{2.5}$ emissions (*i.e.,* nitrates and sulfates). Please note, that appropriate guidance for this evaluation is the "Guidance for $PM_{2.5}$ Permit Modeling", finalized in 2014. EPA does not believe that relying on EPA's 2010 $PM_{2.5}$ guidance for the assessment of secondary $PM_{2.5}$ emissions is appropriate. These are important considerations given the large project SO_2 and NO_2 emissions and a resulting $PM_{2.5}$ controlling concentration within 6% of the NAAQS concentration considering only direct emissions.

Previously Resolved

6) Two-Prong Culpability Contribution Analysis

To address the project's contribution to modeled NAAQS violations, a unique, two-prong procedure was used. The first prong consisted of modeling the project's impacts along a straight line from the project to the nearby source assumed to cause the violation. It was assumed that the maximum interaction between these sources would occur along the straight line path downwind of the other source with no consideration of real atmospheric conditions where plumes interact. The second prong, which is also addressed above in comment #2, is a cumulative NAAQS compliance assessment performed using actual emissions, rather than permit allowable emissions, for the facilities contributing most to the modeled violations. Please provide the technical basis for accepting this two-prong culpability approach used to demonstrate no significant project impact to all modeled NAAQS exceedances.

Addressed
- The new modeling will perform the culpability analysis using AERMOD MAXCOUNT option. This would be a definitive method of determining MS Silicon's contribution to all modeled violations. The two-prong procedure for culpability contribution analysis will not be used.
- This assessment needs to show that the project will not have a significant contribution to any modeled violation. The MAXCOUNT assessment will performed on modeling results using final configuration of all emission sources with allowable or maximum potential emissions and receptor grids of 100-m resolution.

7) Modeling Procedure for 1-Hour NO_2

The use of actual emissions (*see* EPA questions 2 and 6, above) for the two significant nearby facilities reduced the number of modeled NO_2 violations but MS Silicon significantly contributed to some of the remaining modeled violations. The applicant used an 8 step process to resolve MS Silicon's contribution to the modeled NO_2 violations but only for "critical" receptors, as described in the application. This process does not address significant contribution by MS Silicon to all model concentrations exceeding the NAAQS. Please provide the technical basis for the conclusion that there are no significant project contributions to any modelled concentration exceeding the NAAQS.

Addressed
- The new MDEQ 1-Hour NO_2 modeling will perform the culpability analysis using AERMOD MAXCOUNT option. The two-prong procedure for culpability contribution analysis will not be used.
- This culpability assessment will identify any modeled 1-Hour NO_2 NAAQS exceedance where the project has a significant contribution. The MAXCOUNT assessment will performed on modeling results using final configuration of all emission sources with allowable or maximum potential emissions and receptor grids of 100-m resolution.

8) Impacts to Soils and Vegetation

Given the modeled NAAQS violations for the 1-hour SO_2 and NO_2, the statement in Section 4.2 that the maximum predicted NO_2 ambient concentrations are below the ambient air quality standards is unsupported and inappropriate. The results of the NAAQS compliance modeling (*i.e.,* cumulative impacts) should be used for comparison to the target values in Tables 4-1. Please provide the technical basis for accepting the applicant's assessment of soils and vegetation impacts.

Previously Addressed

9) PSD Class II Visibility Assessment

The applicant did not include a visibility impairment assessment of the project's impact in the PSD Class II area (*i.e.*, project's impact area). Please provide the technical basis for the conclusion that this analysis was not needed for this project.

Previously Addressed

10) PSD Class I Area SIL Assessment

MS Silicon's PSD Class I area (Sipsey) SO_2 impact assessment was greater than the SIL. A cumulative impact assessment was not performed based on the applicant's statement that it was not aware of any other significant PSD increment consuming SO_2 source that would impact Sipsey. The basis for this statement was not provided. Please provide the steps taken to identify other significant PSD increment consuming SO_2 sources that could impact the Sipsey Wilderness Area. If sources are indeed identified, please provide a cumulative impact assessment or the technical basis for why an assessment is not needed.

Previously Addressed

Stanley Krivo, CCM, QEP
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Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960
Phone: 404/562-9123
Fax: 404/562-9019

Robinson, Donna

From: Forney, Katy
Sent: Tuesday, November 12, 2013 6:05 PM
To: Bonnie_Morgan@deq.state.ms.us
Cc: Calcagni, John; Krivo, Stan; Ceron, Heather
Subject: MS Silicon

Hey Bonnie,

I got your voicemail. John Calcagni and Stan Krivo have been reviewing the MS Silicon permit. I am not sure of the details, but I do believe there are air quality comments in the works. I would suggest asking Stan and/or John for details. I copied them on this email. Let me know if you need help getting a hold of them. They are busy bees. ☺

Thanks,
Katy

Katy R. Lusky
Energy Sector Technical Authority
Air Permits Section
EPA Region 4
404-562-9130

Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Tuesday, October 22, 2013 6:37 PM
To: Krivo, Stan
Subject: Fw: MS Silicon Modeling Update - Class I Summary and Results
Attachments: MS Silicon Executive Summary Letter (2).pdf

FYI

Jacqueline Evans
Environmental Permits Division - Modeling Branch
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----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 10/22/2013 05:36 PM -----

From: "Steve Frey"
To: , ,
Cc: , , "Cameron Ross" , "Kristin Frey" ,
Date: 10/22/2013 05:05 PM
Subject: FW: MS Silicon Modeling Update - Class I Summary and Results

---

Bonnie and Jacqueline,

As shown in the attached results the proposed project will not have a significant impact on the Class I increments , visibility impairment or deposition impact at the Sipsey and Mingo Wilderness areas based on operation of two SAFs versus four SAFs. An email provided by the Manager of the Mingo Wilderness area earlier today stated that they have no concerns with the potential impact of the proposed plant on that Class I area.

The only item of discussion in the attached results in that the proposed plant will have predicted impacts of SO2 emissions that will be above the significant impact levels for the 3-hour and 24-hour averaging period. However the predicted concentrations are slightly above the SILs. The predicted concentrations from the proposed plant are shown to be 1.0 ug/m3 for the Class I 3-hour increment which is only 4% of the Class I increment of 25 ug/m3. Predicted concentrations for the 24-hour period were 0.2 ug/m3 which also only represents 4% of the Class I increment of 5 ug/m3. MS Silicon is not aware of any other SO2 source in the area that when combined with the potential impacts from the MS Silicon plant would cause an exceedance of the Class I increments at Sipsey Wilderness area.

We are in the process of rerunning the model per a comment provided by EPA Region IV that suggested the chemistry and deposition switches be turned off in the Calpuff model for the PSD Class I Increment analysis. The changing of these switches should

not significantly affect the outcome of the Class I increment analysis. Those results will be provided to the MDEQ by October 18, 2013. Because of the complexity of this model it actual run time is several days in duration. The model will not complete its analysis until the 18th.

Best Regards

Steve

Steven Frey
Manager Air Quality
Kennedy/Jenks Consultants
1515 East Woodfield Road, Suite 360
Schaumburg, Illinois 60173
Office Phone: 847-278-7705
Email: stevefrey@kennedyjenks.com

From: Steve Frey
Sent: Thursday, October 10, 2013 6:42 AM
To: Bonnie_Morgan@deq.state.ms.us; Jacqueline_Evans@deq.state.ms.us
Cc: Kristin Frey; karenthirman@kennedyjenks.com; Cameron Ross; Scott Adamson (scott.adamson@metsolution.com)
Subject: FW: MS Silicon Modeling Update - Class I Summary and Results
Importance: High

Bonnie and Jacqueline,

Attached is a summary letter that summarizes the results of the Class I impact analysis at Sipsey Wilderness Area and Mingo Wilderness area. The modeling files are available for downloading from Kennedy/Jenks Consultants. I will ask Cameron Ross to provide that information in a separate email.

Please let me know if this letter contains sufficient information to meet MDEQ technical requirements. A more detailed document can also be prepared and provided to the MDEQ as Addendum #2 to the PSD application if so required.

Best Regards

Steve

Steven Frey
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Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Monday, October 28, 2013 4:34 PM
To: Krivo, Stan
Subject: Fw: MS Silicon SIL Analysis - Per EPA Region IV Recommendation
Attachments: MS Silicon Class I SIL Analysis (No Chemical Transformation).pdf

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Jacqueline Evans
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----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 10/28/2013 03:33 PM -----

From: **"Steve Frey"**
To: , ,
Cc: , , **"Cameron Ross"** , **"Kristin Frey"** ,
Date: **10/28/2013 03:19 PM**
Subject: **FW: MS Silicon SIL Analysis - Per EPA Region IV Recommendation**

Jacqueline

As recommended by the EPA Region IV, the Class I increment analysis has been rerun for the Sipsey Wilderness Area with the deposition chemical transformation algorithms turned off. Attached you will find the updated results. The SO2 3-hour and 24-hour impacts did go up slightly, however the resultant concentrations are less than 10% of the PSD Class I increments. As stated previously, MS Silicon is not aware of any other significant SO2 sources in the area that also consume increment and should be evaluated for SO2 increment consumption at the Sipsey Wilderness Area. The impact analysis performed reflects two submerged arc furnaces operating simultaneously from the proposed MS Silicon plant.

Best Regards

Steve

Steven Frey
Manager Air Quality
Kennedy/Jenks Consultants

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Email: stevefrey@kennedyjenks.com

From: Scott Adamson [mailto:scott.adamson@metsolution.com]
Sent: Friday, October 25, 2013 3:47 PM
To: Steve Frey
Cc: Linda Conger
Subject: MS Silicon SIL Analysis

Steve,

Please find attached a table summarizing the results of the latest Class I SIL analysis. At the suggestion of the EPA, CALPUFF was run with visibility and deposition chemical transformation algorithms turned off to determine the maximum pollutant concentrations at Mingo and Sipsey Wilderness areas from the proposed Mississippi Silicon, LLC facility.

The maximum concentrations of SO2, NO2, PM10, and PM2.5 at the Sipsey and Mingo Wilderness Areas were compared with Class I Significant Impact Levels (SILs). According to guidance, if maximum concentrations are below the SILs, then emissions from the facility are assumed to be insignificant and no further analysis is needed. As can be seen in the attached summary, results of the modeling show that model predicted concentrations on the Mingo and Sipsey Wilderness areas were higher than the results presented in the technical report. However, the three-hour and 24-hour SO2 concentrations at Sipsey Wilderness area remain the only modeled pollutant concentrations above the respective Class I SILs. For pollutant concentrations below the SIL, the emissions from the Mississippi Silicon, LLC facility are assumed to be insignificant which means that emissions from the proposed facility will not have the potential to cause or contribute to an exceedance of an ambient air quality standard or PSD increment.

Please let me know if you have any questions or if a cumulative impact analysis will be needed. We will upload the modeling files for this analysis to Kennedy/Jenks FTP server.

Thanks,
Scott
Scott Adamson
Meteorologist/Dispersion Modeler
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Mississippi Silicon Class I SIL Analysis

SIL Analysis with visibility and deposition chemical transformation turned off in CALPUFF

Mingo

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (ug/m3)			SIL Class I Significant Impact Levels (ug/m3)	Maximum Percent of SIL
		2001	2002	2003		
SO2	3-hour (H1H)	0.3954	0.2921	0.1945	1.0	39.5%
	3-hour (H2H)	0.3723	0.1467	0.1658	1.0	37.2%
	24-hour (H1H)	0.1569	0.0741	0.0679	0.2	78.5%
	24-hour (H2H)	0.0585	0.0480	0.0636	0.2	31.8%
	Annual (H1H)	0.0022	0.0018	0.0023	0.1	2.3%
NO2	Annual (H1H)	0.0020	0.0016	0.0021	0.1	2.1%
PM10	24-hour (H1H)	0.0066	0.0021	0.0026	0.3	2.2%
	24-hour (H2H)	0.0025	0.0017	0.0025	0.3	0.8%
	Annual (H1H)	0.000094	0.000068	0.000096	0.2	0.0%
PM2.5	24-hour (H1H)	0.0056	0.0020	0.0022	0.07	8.0%
	24-hour (H2H)	0.0021	0.0015	0.0022	0.07	3.2%
	Annual (H1H)	0.000081	0.000060	0.000083	0.06	0.1%

Sipsey

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (ug/m3)			SIL Class I Significant Impact Levels (ug/m3)	Maximum Percent of SIL
		2001	2002	2003		
SO2	3-hour (H1H)	1.2540	1.0550	1.4359	1.0	143.6%
	3-hour (H2H)	1.1071	0.8076	0.9714	1.0	110.7%
	24-hour (H1H)	0.2846	0.2531	0.3142	0.2	157.1%
	24-hour (H2H)	0.2450	0.2335	0.2622	0.2	131.1%
	Annual (H1H)	0.0121	0.0130	0.0157	0.1	15.7%
NO2	Annual (H1H)	0.0106	0.0115	0.0139	0.1	13.9%
PM10	24-hour (H1H)	0.0178	0.0097	0.0100	0.3	5.9%
	24-hour (H2H)	0.0096	0.0091	0.0094	0.3	3.2%
	Annual (H1H)	0.0005	0.0005	0.0006	0.2	0.3%
PM2.5	24-hour (H1H)	0.0141	0.0085	0.0088	0.07	20.1%
	24-hour (H2H)	0.0075	0.0080	0.0082	0.07	11.7%
	Annual (H1H)	0.0004	0.0004	0.0006	0.06	0.9%

Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Tuesday, November 12, 2013 2:08 PM
To: Krivo, Stan
Subject: Fw: FLM decision for Sipsey Wilderness

Bill Jackson sent this today. Thanks, Jackie

Jacqueline Evans
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----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 11/12/2013 01:06 PM -----

From: "Jackson, Bill -FS"
To: "Bonnie_Morgan@deq.state.ms.us" ,
Cc: "Jacqueline_Evans@deq.state.ms.us" , "Steve Frey (SteveFrey@KennedyJenks.com)"
Date: 11/12/2013 12:56 PM
Subject: FLM decision for Sipsey Wilderness

Hi Bonnie,

I hope you are doing well today.

I wanted to let you know that the FLM for Sipsey Wilderness (Steve Lohr, Forest Supervisor, National Forest in Alabama) has made his decision and will be recommending that the proposed Mississippi Silicon facility will have no adverse impacts to the AQRVs at the Class I area. This is assuming the annual and peak emissions rates remain the same, and the permit condition that only two of the submerged arc furnaces are operated simultaneously. I don't expect any changes, but consider this information tentative until your agency receives the official letter.

Would you please send me the name of the current Director for MDAQ and the address we should send the letter from the FLM?

I look forward to working with you and Jackie on future projects.

Best regards,

Bill Jackson

Air Resource Specialist
USDA Forest Service
160A Zillicoa Street
Asheville, NC 28801

Email: bjackson02@fs.fed.us
Office phone #: 828-257-4815

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Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Tuesday, November 12, 2013 2:17 PM
To: Krivo, Stan
Subject: Fw: MS Silicon - Modeling Concentration Dates - Email #2
Attachments: 23OCT2013_Email_KFrey_Attachment_Tables 5 - Modeling Tables - Initial Application - Revised 10-23-2013.pdf

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Jacqueline Evans
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----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 11/12/2013 01:15 PM -----

From: "Kristin Frey"
To: , ,
Cc: "Steve Frey"
Date: 10/23/2013 03:35 PM
Subject: RE: MS Silicon - Modeling Concentration Dates

[attachment "Tables 5 - Modeling Tables - Initial Application - Revised 10-23-2013.pdf" deleted by Jacqueline Evans/EPD/OPC/DEQ]

Bonnie & Jacqueline –

Attached are updated versions of Tables 5a, 5b and 5c. I updated the tables to include the concentration dates, the annual values do not have specific dates.

Please let us know if you have any questions.

Thanks,
Kristin

From: Steve Frey
Sent: Wednesday, October 23, 2013 12:10 PM
To: Bonnie_Morgan@deq.state.ms.us; Jacqueline_Evans@deq.state.ms.us
Cc: Kristin Frey; karenthirman@kennedyjenks.com; Cameron Ross
Subject: MS Silicon - Modeling Questions Response Letter
Importance: High

Bonnie and Jacqueline

As discussed yesterday, attached is a letter containing a response to each question raised by the MDEQ and EPA Region IV. Let me know if you have any questions or comments related to the content of this letter.

Best Regards

Steve

Steven Frey
Manager Air Quality
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Table 5a
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to SILs

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PM_{10}	24-hour	2007	20.47	07/10/05/24	378671.74	3852133.81	5	Highest first high of the 5 years	Yes
		2008	19.03	08/10/05/24	378565.00	3851620.00			Yes
		2009	16.00	09/09/18/24	378653.08	3852095.12			Yes
		2010	16.83	10/07/04/24	378810.99	3852298.80			Yes
		2011	14.63	11/10/20/24	379365.00	3851920.00			Yes
		2007 - 2011	20.47	--	378671.74	3852133.81			Yes
	Annual	2007	3.53	--	378852.62	3852323.27	1.00	Highest of the 5 years	Yes
		2008	2.98	--	378852.62	3852323.27			Yes
		2009	3.25	--	379000.41	3852321.36			Yes
		2010	3.25	--	379000.41	3852321.30			Yes
		2011	3.59	--	379049.67	3852320.72			Yes
		2007 - 2011	--	--	--	--			Yes
$PM_{2.5}$	24-hour	2007	9.41	07/10/05/24	378671.74	3852133.81	1.2	Average of the highest from each year	Yes
		2008	7.79	08/10/13/24	378709.06	3852211.17			Yes
		2009	7.42	09/09/18/24	378653.08	3852095.12			Yes
		2010	8.22	10/07/04/24	378810.99	3852298.8			Yes
		2011	7.77	11/09/19/24	378852.62	3852323.27			Yes
		2007 - 2011	7.43	--	378852.62	3852323.27			Yes
	Annual	2007	1.94	--	378852.62	3852323.27	0.3	Average of the highest from each year	Yes
		2008	1.66	--	378852.62	3852323.27			Yes
		2009	1.62	--	379000.41	3852321.36			Yes
		2010	1.61	--	379000.41	3852321.36			Yes
		2011	1.86	--	379000.41	3852321.36			Yes
		2007 - 2011	1.50	--	379000.41	3852321.36			Yes
NO_2	1-hour	2007	113.20	07/01/20/06	378886.76	3851765.89	7.52	Average of the highest maximum daily 1-hour concentration from the 5-year period	Yes
		2008	119.77	08/05/21/22	378886.76	3851765.89			Yes
		2009	114.21	09/01/06/12	380565.00	3851820.00			Yes
		2010	110.72	10/01/12/21	378886.76	3851765.89			Yes
		2011	111.12	11/12/17/07	378935.83	3851765.00			Yes
		2007 - 2011	111.35	--	378935.83	3851765.00			Yes
	Annual	2007	6.19	--	378886.76	3851765.89	1	Highest of the 5 years	Yes
		2008	4.57	--	378886.76	3851765.89			Yes
		2009	4.96	--	378788.62	3851767.67			Yes
		2010	5.48	--	378788.62	3851767.67			Yes
		2011	5.02	--	378788.62	3851767.67			Yes
		2007 - 2011	--	--	--	--			Yes
SO_2	1-hour	2007	110.58	07/12/30/09	380165.00	3850920.00	7.8	Average of the highest maximum daily 1-hour concentration from each year	Yes
		2008	122.01	08/02/24/09	377365.00	3850720.00			Yes
		2009	128.49	09/01/06/12	380665.00	3851820.00			Yes
		2010	120.87	10/01/28/10	380165.00	3852220.00			Yes
		2011	97.54	11/02/23/09	376365.00	3851820.00			Yes
		2007 - 2011	128.49	--	380665.00	3851820.00			Yes
	3-hour	2007	68.82	07/06/18/12	379065.00	3852520.00	25	Highest first high of the 5 years	Yes
		2008	67.23	08/10/22/12	378865.00	3852620.00			Yes
		2009	74.63	09/12/27/15	379865.00	3852120.00			Yes
		2010	68.91	10/06/22/12	379065.00	3852620.00			Yes
		2011	69.12	11/09/01/12	379265.00	3852620.00			Yes
		2007 - 2011	74.63	--	379865.00	3852120.00			Yes
	24-hour	2007	26.58	07/09/05/24	378965.00	3852620.00	5	Highest first high of the 5 years	Yes
		2008	26.51	08/06/06/24	379065.00	3852820.00			Yes
		2009	31.02	09/06/17/24	379665.00	3852020.00			Yes
		2010	29.33	10/06/14/24	379665.00	3852120.00			Yes
		2011	27.83	11/05/28/24	379365.00	3852820.00			Yes
		2007 - 2011	31.02	--	379665.00	3852020.00			Yes
	Annual	2007	4.79	--	378965.00	3852720.00	1	Highest of the 5 years	Yes
		2008	3.39	--	378865.00	3852920.00			Yes
		2009	3.47	--	379365.00	3852820.00			Yes
		2010	4.13	--	379265.00	3852720.00			Yes
		2011	4.00	--	379365.00	3852820.00			Yes
		2007 - 2011	--	--	--	--			Yes
CO	1-hour	2007	116.74	07/01/20/06	378886.76	3851765.89	2000	Average of the highest from each year	No
		2008	123.52	08/05/21/22	378886.76	3851765.89			No
		2009	117.16	09/02/23/07	378935.83	3851765.00			No
		2010	114.18	10/01/12/21	378886.76	3851765.89			No
		2011	114.59	11/12/17/07	378935.83	3851765.00			No
		2007 - 2011	123.52	--	378886.76	3851765.89			No
	8-Hour	2007	63.03	07/12/24/08	378951.14	3852322.00	500	Average of the highest from each year	No
		2008	61.97	08/04/21/08	378886.76	3851765.89			No
		2009	53.96	09/11/20/24	378788.62	3851767.67			No
		2010	47.26	10/11/13/08	379000.41	3852321.36			No
		2011	57.65	11/11/18/08	378788.62	3851767.67			No
		2007 - 2011	63.03	--	378951.14	3852322.00			No

Table 5b
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to SMCs

Pollutant	Averaging Period	Meteorological Data Period	Modeled Concentration (µg/m³)	Date and Concentration (YY/MM/DD/HH)	Receptor Point (Northing)	Receptor Point (Easting)	SMC (µg/m³)	Concentration Ba
PM_{10}	24-hour	2007	20.47	07/10/05/24	378671.74	3852133.81	10	Highest first high c years
		2008	19.03	08/10/05/24	378565.00	3851620.00		
		2009	16.00	09/09/18/24	378653.08	3852095.12		
		2010	16.83	10/07/04/24	378810.99	3852298.80		
		2011	14.63	11/10/20/24	379365.00	3851920.00		
		2007 - 2011	20.47	07/10/05/24	378671.74	3852133.81		
$PM_{2.5}$	24-hour	2007	9.41	07/10/05/24	378671.74	3852133.81	4	Average of the high each year
		2008	7.79	08/10/13/24	378709.06	3852211.17		
		2009	7.42	09/09/18/24	378653.08	3852095.12		
		2010	8.22	10/07/04/24	378810.99	3852298.8		
		2011	7.77	11/09/19/24	378852.62	3852323.27		
		2007 - 2011	7.43	--	378852.62	3852323.27		
NO_2	Annual	2007	6.19	--	378886.76	3851765.89	14	Highest of the 5
		2008	4.57	--	378886.76	3851765.89		
		2009	4.96	--	378788.62	3851767.67		
		2010	5.48	--	378788.62	3851767.67		
		2011	5.02	--	378788.62	3851767.67		
		2007 - 2011	--	--	--	--		
SO_2	24-hour	2007	26.58	07/09/05/24	378965.00	3852620.00	13	Highest first high c years
		2008	26.51	08/06/06/24	379065.00	3852820.00		
		2009	31.02	09/06/17/24	379665.00	3852020.00		
		2010	29.33	10/06/14/24	379665.00	3852120.00		
		2011	27.83	11/05/28/24	379365.00	3852820.00		
		2007 - 2011	31.02	09/06/17/24	379665.00	3852020.00		
CO	8-Hour	2007	63.03	07/12/24/08	378951.14	3852322.00	575	Highest first high c years
		2008	61.97	08/04/21/08	378886.76	3851765.89		
		2009	53.96	09/11/20/24	378788.62	3851767.67		
		2010	47.26	10/11/13/08	379000.41	3852321.36		
		2011	57.65	11/11/18/08	378788.62	3851767.67		
		2007 - 2011	63.03	07/12/24/08	378951.14	3852322.00		

Note: MDEQ maintains a network of ambient monitors located throughout the state which are located to reflect background levels of specified criteria air pollutants across the stat background data, no pre-construction or post-construction monitoring should be required in the vicinity of the proposed MS Silicon plant project.

Table 5c
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to PSD Class II Increments

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PM_{10}	24-hour	2007	16.07	07/08/09/24	379363.47	3852190.55	30	Highest of the second high from each of the 5 years
		2008	16.68	08/09/22/24	378565.00	3851520.00		
		2009	14.46	09/09/23/24	378665.00	3852120.00		
		2010	13.96	10/08/31/24	378852.62	3852323.27		
		2011	13.49	11/08/22/24	378739.55	3851768.56		
		2007 - 2011	16.68	--	378565.00	3851520.00		
	Annual	2007	3.53	--	378852.62	3852323.27	17	Highest of the 5 years
		2008	2.98	--	378852.62	3852323.27		
		2009	3.25	--	379000.41	3852321.36		
		2010	3.25	--	379000.41	3852321.3		
		2011	3.59	--	379049.67	3852320.72		
		2007 - 2011	--	--	--	--		
$PM_{2.5}$	24-hour	2007	7.55	07/07/16/24	378852.62	3852323.27	9	Highest of the second high from each of the 5 years
		2008	7.17	08/09/22/24	378565.00	3851620.00		
		2009	7.12	09/11/23/24	378852.62	3852323.27		
		2010	7.82	10/08/30/24	378810.99	3852298.80		
		2011	6.74	11/11/06/24	378852.62	3852323.27		
		2007 - 2011	7.06	--	378852.62	3852323.27		
	Annual	2007	1.94	--	378852.62	3852323.27	4	Highest of the 5 years
		2008	1.66	--	378852.62	3852323.27		
		2009	1.62	--	379000.41	3852321.36		
		2010	1.61	--	379000.41	3852321.36		
		2011	1.86	--	379000.41	3852321.36		
		2007 - 2011	--	--	--	--		
NO_2	Annual	2007	6.19	--	378886.76	3851765.89	25	Highest of the 5 years
		2008	4.57	--	378886.76	3851765.89		
		2009	4.96	--	378788.62	3851767.67		
		2010	5.48	--	378788.62	3851767.67		
		2011	5.02	--	378788.62	3851767.67		
		2007 - 2011	--	--	--	--		
SO_2	3-hour	2007	67.24	07/08/11/12	378865.00	3851420.00	512	Highest of the second high from each of the 5 years
		2008	62.72	08/07/17/12	378765.00	3852720.00		
		2009	64.54	09/10/19/12	379165.00	3852620.00		
		2010	66.90	10/09/06/15	379065.00	3852620.00		
		2011	65.39	11/10/25/15	379265.00	3852620.00		
		2007 - 2011	68.89	--	379065.00	3852520.00		
	24-hour	2007	25.40	07/07/16/24	378965.00	3852720.00	91	Highest of the second high from each of the 5 years
		2008	25.45	08/06/07/24	379065.00	3852720.00		
		2009	26.02	09/06/20/24	379465.00	3851620.00		
		2010	24.85	10/07/03/24	379165.00	3852820.00		
		2011	23.89	11/09/16/24	378565.00	3851420.00		
		2007 - 2011	29.33	--	379665.00	3852120.00		
	Annual	2007	4.79	--	378965.00	3852720.00	20	Highest of the 5 years
		2008	3.39	--	378865.00	3852920.00		
		2009	3.47	--	379365.00	3852820.00		
		2010	4.13	--	379265.00	3852720.00		
		2011	4.00	--	379365.00	3852820.00		
		2007 - 2011	--	--	--	--		

Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Tuesday, November 12, 2013 2:27 PM
To: Krivo, Stan
Subject: Fw: MS Silicon - Modeling Questions Response Letter - Email #5
Attachments: 23OCT2013_Email_SFrey_Attachment_SKMBT_C55413102312070.pdf

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Jacqueline Evans
Environmental Permits Division - Modeling Branch
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----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 11/12/2013 01:25 PM -----

From: "Steve Frey"
To: , ,
Cc: "Kristin Frey" , , "Cameron Ross"
Date: 10/23/2013 12:12 PM
Subject: MS Silicon - Modeling Questions Response Letter

[attachment "SKMBT_C55413102312070.pdf" deleted by Jacqueline Evans/EPD/OPC/DEQ]
Bonnie and Jacqueline

As discussed yesterday, attached is a letter containing a response to each question raised by the MDEQ and EPA Region IV. Let me know if you have any questions or comments related to the content of this letter.

Best Regards

Steve

Steven Frey
Manager Air Quality
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October 23, 2013

Ms. Bonnie Grey Morgan
Mississippi Department of Environmental Quality (MDEQ)
Office of Pollution Control
Environmental Permits Division
P.O. Box 2261
Jackson, Mississippi 39225

RE: Response (#2) to Additional Questions Raised by MDEQ – Air Quality Impact Evaluation
Proposed Silicon Manufacturing Plant
Burnsville, Tishomingo County, Mississippi
Mississippi Silicon LLC

To: Bonnie Morgan

Mississippi Silicon LLC (MS Silicon) is proposing the construction of a new Greenfield silicon manufacturing plant to be located in Tishomingo County, Mississippi. The silicon manufacturing plant being proposed by MS Silicon will be capable of producing a high quality, low cost silicon. The manufacturing plant will utilize four (4) semi-enclosed submerged arc furnaces (SAF) with a capacity of 2.75 tons/hr each (~45 MVA) to produce approximately 84,096 tons/year of 98-99% pure silicon metal. Based on potential emissions of regulated air pollutants from the proposed silicon manufacturing plant, the plant will be considered a New Major Stationary Source under the Prevention of Significant Deterioration (PSD) regulations.

An air permit application (PSD Construction Permit Application), dated August 15, 2013 was submitted by MS Silicon to the Mississippi Department of Environmental Quality (MDEQ). Included in that application were the results obtained from performing an air quality impact evaluation for the proposed plant only. The results obtained from that evaluation triggered the requirement to conduct a multi-source air quality impact evaluation which is currently ongoing and will be submitted to the MDEQ as an addendum to the initial air permit application. Predicted impacts from the proposed plant only, were shown to be below EPA's PSD Class II increments and National Ambient Air Quality Standards (NAAQS).

Since submission of that application, the modeling staff of the MDEQ has reviewed the air quality impact evaluation submitted in that application. Upon completion of that review, a few questions / comments were provided by the MDEQ during a conference call held on October 17, 2013.

Provided below is a response to each question / comment raised by the MDEQ during that conference call on October 17, 2013:

Question #1: Please clarify the rationale for averaging the $PM_{2.5}$ background concentrations that were used in the NAAQS compliance analysis.

Response #2: MS Silicon provided the MDEQ with a letter dated October 2, 2013 that described the method used for determining the $PM_{2.5}$ background concentrations that were used in the NAAQS

compliance demonstration. In that response, three (3) existing monitoring stations were identified that could be considered representative of the $PM_{2.5}$ background concentrations in the state of Mississippi. The three monitors are located in DeSoto County, Grenada County and Lee County. The monitor in Lee County was excluded as a representative monitor since the monitor is located near a regional airport that could affect the measurements of the $PM_{2.5}$ monitor, thus not considered representative of the proposed rural site of the MS Silicon plant site. Further review of the monitors located in DeSoto County and Grenada County determined that the monitors are located in more rural environments similar to that of the proposed plant site. So to not show bias towards one of the two monitors, the results were averaged to reflect a representative $PM_{2.5}$ background concentration for the annual and 24-hour averaging periods. The resultant concentrations were 9.65 and 18.5 ug/m^3 for the annual and 24-hour averaging periods, respectively. Even if the higher of the two monitors' measured concentrations for the annual and 24-hour averaging periods were selected, the resultant total predicted concentration would still be below the annual and 24-hour $PM_{2.5}$ NAAQS.

Question #2: Please respond to using EPA "Draft Guidance of $PM_{2.5}$ Permit Modeling".

Response #2: EPA has issued "Draft Guidance for $PM_{2.5}$ Permit Modeling", dated March 4, 2013. In the memorandum attached to this guidance, EPA states that the guidance is EPA's preliminary recommendation and is proposing a demonstration method that may be used. This guidance is currently undergoing public review / comment. EPA states that the release of the final guidance document, at the conclusion of this review process, will fulfill a need for additional guidance on demonstrating compliance with the $PM_{2.5}$ NAAQS, especially with regard to consideration of the secondarily formed component of $PM_{2.5}$. Since the guidance is draft and EPA states additional guidance will be forthcoming, this draft guidance was not used in support of the MS Silicon plant project's $PM_{2.5}$ NAAQS. For purposes of the PSD permitting process, MS Silicon has relied on the guidance defined by EPA as part of a memorandum dated March 23, 2010, entitled "Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS".

Further review of the sources being proposed for the MS Silicon plant revealed that the only potential sources of secondary $PM_{2.5}$ could occur from the submerged arc furnaces (SAF). The actual transition of sulfur and oxides of nitrogen to sulfates and nitrates is unknown at this time. However, any transition from a gaseous phase to a particulate phase occurring in the exhaust gas stream will be captured and controlled by the negative pressure baghouse being installed on each individual SAF. To account for the potential formation of sulfates and nitrates after passing through the baghouse, a conservative approach is being employed. This approach involves using the maximum predicted concentration as predicted by the dispersion model AERMOD and then summing that concentration with the representative background concentration. The representative background concentration should already account for primary and secondary $PM_{2.5}$ formation from other existing sources. The maximum annual and 24-hour $PM_{2.5}$ concentrations can be found in Table 5b of Addendum #1. The maximum annual $PM_{2.5}$ concentration is 9.41 ug/m^3 and the representative background concentration is 19 ug/m^3 (based on the Grenada County monitor). The resultant total concentration when summed is 28.41 ug/m^3 which is 81% of the 24-hour NAAQS (35 ug/m^3). Thus any potential for secondary formation of $PM_{2.5}$ from the proposed project should not threaten compliance with the $PM_{2.5}$ NAAQS. The $PM_{2.5}$ maximum annual concentration is also below the $PM_{2.5}$ annual NAAQS. Since the majority of the maximum combined predicted concentration (i.e., 82%) is from the regional background concentration at the DeSoto County monitor (i.e., 9.8 ug/m^3) and already accounts for primary and secondary $PM_{2.5}$, the proposed project is not anticipated to significantly contribute secondary $PM_{2.5}$ formation on a long term basis based on incorporation of the a negative pressure baghouse for each individual SAF.

Question #3: Please further expand upon on how the NO_2 and SO_2 1-hour NAAQS analysis was performed.

Response #3: The results of the multi-source NAAQS compliance demonstration for emissions of PM_{10} and $PM_{2.5}$ from the MS Silicon project show predicted concentrations that, when combined with representative background concentrations, meet the corresponding NAAQS. Predicted concentrations of SO_2 emission during a 3-hour, 24-hour and annual averaging period, as well as emissions of NO_2 during an annual averaging period combined with representative backgrounds were also shown to be below the corresponding NAAQS.

Predicted concentrations of the NO_2 1-hour and SO_2 1-hour impacts from the multi-source NAAQS analysis were shown to be above the corresponding NAAQS. The high predicted concentrations were due entirely to two (2) existing sources located within a distance of 50 kilometers from the proposed plant site location. These two sources, by themselves, caused predicted concentrations (based on evaluation of worst case permit allowable emission rates) to be above the 1-hour NAAQS for emissions of NO_x and SO_2. It should be noted that predicted concentrations from the NO_x and SO_2 emissions sources associated with the proposed MS Silicon plant project were below the 1-hour NAAQS when combined with a representative background concentration.

The two existing sources (Columbia Gulf Transmission - Mississippi and TVA Colbert - Alabama) are located at a distance of approximately 19 kilometers and 45 kilometers, respectively, from the proposed MS Silicon plant site.

According to EPA guidance, a new project going through PSD review must contain an air quality impact evaluation that demonstrates that the project's emissions of regulated air pollutants will not cause or contribute to a violation of an existing NAAQS. A PSD permit can be issued that shows predicted exceedances of the NAAQS, however the proposed source must not contribute to that exceedance. To demonstrate that a source does not contribute to an exceedance, the air quality impact demonstration must show that predicted concentrations from the new project will not be significant (concentrations less than the corresponding Significant Impact Level (SIL)) at the point of these exceedances. If predicted concentrations are below the SILs then the predicted impacts are considered insignificant.

To demonstrate that the proposed MS Silicon plant will have an insignificant impact in the area of predicted exceedances of the SO_2 and NO_2 1-hour NAAQS, additional dispersion modeling was performed. Since there are numerous predicted concentrations above the 1-hour NAAQS at receptors in the vicinity of these two sources, a two prong approach was utilized. This involved: 1) looking at the worst interaction between the existing sources and the proposed project, and 2) evaluating the maximum predicted concentrations taking into account 2012 actual emissions from the two existing sources. It is important to note that these high predicted concentrations are based on the emission source inventories assembled by the individual state agencies and is based on permit allowables. Further review of these inventories should be conducted by the respective companies to confirm the accuracy of the inventory assembled. It is possible that the inventory may include technical discrepancies that once reviewed and adjusted may significantly reduce the potential impacts on ambient air quality.

Since predicted concentrations were shown to be above the NAAQS for the two existing sources mentioned above and each source was shown in and by itself to cause a predicted exceedance of the SO_2 and NO_2 1-hour NAAQS, additional analyses were (as discussed above) conducted by MS Silicon. The analysis that was performed utilized the following methodology:

1. A line was drawn from the location of the proposed MS Silicon plant to the source located in Mississippi, as well as the source located in Alabama. This line represents the maximum interaction between the sources. In short, to obtain the maximum downwind interaction from two sources, the wind has to flow along that straight line and the resultant maximum point of interaction would be along that line downwind of the second source;

2. To determine the maximum concentration of the two interacting sources, receptors were placed along that diagonal line downwind of the second source spaced at a distance of 250 meters out to 1,250 meters;

3. The AERMOD dispersion model was rerun on those diagonal line receptors for each of the five years of meteorological data and only the emissions from the proposed MS Silicon plant were evaluated on those downwind receptors;

4. The predicted concentrations from the MS Silicon sources were then compared against the corresponding SIL for each individual receptor point;

5. Predicted SO_2 impacts downwind of the TVA Colbert source were shown to be below the corresponding 1-hour SIL. This demonstrates that the proposed MS Silicon plant project will not contribute to an exceedance of an NAAQS since these impacts represent the maximum point of interaction between the two sources;

6. Predicted NO_2 impacts from Columbia Gulf Transmission and TVA Colbert were shown to contribute to an exceedance of the NO_2 1-hour NAAQS. Further evaluation of the receptors downwind of each of these sources showed that the proposed MS Silicon emission sources showed predicted concentrations were above the correspond 1-hour SIL based on the MS Silicon plant operating four (4) SAF simultaneously during a 1-hour period. To reduce the predicted concentrations below the corresponding 1-hour SIL, MS Silicon committed to operating no more than two (2) SAF in any one hour period. To further reduce the predicted concentration, EPA also allows the use of a Tier II conversion factor (i.e., 0.8) which takes into account the conversion of NO_x to NO_2. Using this adjustment factor in conjunction with evaluating predicted concentrations from only two (2) SAF operating simultaneously resulted in predicted concentrations below the 1-hour SIL. Thus demonstrated that the proposed MS Silicon plant project will not contribute to an exceedance of an NAAQS;

7. Additional modeling was also performed utilizing 2012 actual emissions for Columbia Gulf Transmission, as well as TVA Colbert. Insertion of the actual emissions resulted in predicted concentrations that were below the corresponding NO_2 and SO_2 1-hour NAAQS.

8. Additional modeling was also performed to show the predicted concentrations from the plant with other existing sources (including the two existing sources noted above) with actual emission rates. The results obtained from that evaluation show that no predicted exceedances of the 1-hour NO_2 and SO_2 NAAQS occurred.

Question #4: Please clarify how the maximum emission rates were determined for use in the air quality impact evaluation.

Response: #4: The estimated potential to emit emission rates associated with the proposed MS Silicon plant project were based on engineering estimates that were reflective of BACT, as well as established EPA emission factors. For the submerged arc furnace source, emission estimates were based on the maximum design hourly throughput rate and engineering estimates taking into account the raw materials feed rates. The maximum hourly emission rates, expressed in pounds per hour, are reflective of a worst case 1-hour furnace operating scenario. This includes the maximum feed rates of each raw material and composition of those raw materials (i.e., maximum sulfur content). The annual emission rates which are expressed in tons/year are based on the anticipated maximum annual throughput rate and not the maximum hourly rates extrapolated to 8,760 hours per year. For those operations to be controlled by a baghouse, the emission rates are based on the maximum flow rate exiting the baghouse and the maximum grain outlet loading expressed as grains per standard cubic foot of exhaust air. Emissions resulting from the natural gas combustion equipment were based on the maximum design heat input of the combustion devices and established EPA emission factors. The emission rates employed in the air quality impact evaluation were based on the maximum hourly emission rates for each emission source type, along with the conservative assumption that this rate would occur every hour throughout the year (i.e., 8,760 hours per year).

Question #5: Please clarify why the emergency generators were not included in the air quality impact evaluation.

Response #5: The proposed plant will be operating one emergency generator rated at approximately 670 Hp. The unit will operate no more than 100 hours per year to test the integrity of the emergency generator, essentially testing to make sure it will be able to operate during a true emergency situation. On March 01, 2011, USEPA issued additional clarification regarding application of Appendix W Modeling guidance for the 1-hour NO_2 NAAQS. In that guidance, USEPA stated that it is considered acceptable to limit the emission scenarios included in the modeling compliance demonstration for the 1-hour NAAQS to those emissions that are continuous enough or frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations. As mentioned above, the project's proposed emergency generator will only be operated a maximum of 100 hours per year, thus will not be operated continuously or frequent enough to contribute significantly to the annual distribution of the daily maximum 1-hour concentration. Subsequently the emergency generator was not included in the air quality impact evaluation for the proposed plant project.

Question #6: Please provide an ozone impact analysis for emissions of NO_x and VOC from the proposed plant.

Response #6: Refer to attached Exhibit A which provides an ozone impact analysis for the proposed project.

Question #7: Please clarify the emission rates used in the air quality impact evaluation from existing sources.

Response #7: Existing emission inventories were obtained from the states of Mississippi, Tennessee and Alabama. All inventories requested to support the multisource air quality impact evaluation were reviewed and included in the analysis when determined to be significant. The emission rates were

assumed to be reflective of permit allowables or worst case emissions. Inventories for NO_x were not adjusted to account for EPA Tier II conversion factor of 0.8 (NO_x to NO_2 conversion ratio).

Question #8: Please provide potential impact on visibility from the proposed plant project in the vicinity of the proposed plant project.

Response #8: A formal Class I visibility impairment analysis was performed on the Sipsey Wilderness Area which is located approximately 90 kilometers to the southeast of the proposed plant site. The proposed plant project was shown to have no significant visibility impairment on this Class I Area. Based on the inclusion of various control options/ techniques and operating practices, operation of the plant is not anticipated to have any adverse impact on visibility impairment in the immediate vicinity of the plant site as well. The proposed plant project will involve the operation of two SAFs, raw material / product handling operations and supporting operations. The plant will be implementing Best Available Control Technologies, as well as fugitive dust control techniques to minimize potential emission of regulated air pollutants. In addition, during the operation of the equipment associated with this plant, good operating practices will be implemented to avoid excess emissions and to minimize the potential for equipment malfunctions. The plant will also be subject to opacity limits and the requirement to conduct periodic opacity observations.

Question #9: Please provide additional information on the potential for the proposed plant project to affect general growth in the area of the proposed plant site.

Response #9: The plant project being proposed by MS Silicon is being located in northeast Mississippi based on several variables including existing infrastructure and the access to major urban areas. The work force to support the plant is anticipated to come from the local area or may include skilled workers moving from other areas to work at the plant. As a result, there may be a slight increase in the local population based on workers moving to the area. This is common for any new manufacturing operation to be located in a rural or urban environment. The proposed plant project is not anticipating a significant increase in other manufacturing operations to support the plant. The proposed plant should be self-sufficient and will be able to produce its product without support from other manufacturing operations having to be located in the immediate vicinity of the proposed plant site.

Question #10: Please identify whether or not the proposed property boundary will have a fence or similar type of physical barrier.

Response #10: The proposed plant's property boundary will either have a fence or similar type of physical barrier to prevent unauthorized access onto the proposed plant property.

Question #11: Please confirm how fugitive emissions will be controlled to satisfy high PM emission estimated control efficiencies.

Response #11: MS Silicon will be implementing a variety of different control techniques to minimize fugitive PM emissions. This will include development and implementation of a site specific fugitive dust control plan. This plan will be shared with the MDEQ prior to commencement of operation of the plant. Included in the plan will be specific procedures that will be implemented by the plant's environmental staff to minimize fugitive dust formation. This will include installation of dust control measures such as building structures, wind barriers and other appropriate techniques. Roadway sweeping or wetting will also be utilized along with requiring trucks to maintain a minimum speed while onsite. Appropriate procedures will also be implemented including fugitive dust control (i.e., wetting agents) on the raw

material storage piles, as well as minimizing the disturbance of these raw material piles during days with high wind episodes. The plant will also be designed to have paved roadways upon which primary trucks entering and leaving the plant will utilize. A daily visible dust inspection program will also be implemented to ensure fugitive dust is not visibly present, if so appropriate dust minimization efforts will be implemented.

If you should have any questions regarding the content of this letter please address all questions or comments to Mr. Steven Frey at (847) 278-7705. Mr. Frey is the primary point of contact for this application on behalf of MS Silicon.

Sincerely,
Kennedy/Jenks Consultants

Steven A. Frey
Manager Air Quality

Attached – Exhibit A Ozone Impact Analysis

Exhibit A - Potential Impact to Formation of Ground Level Ozone

A National Ambient Air Quality Standard (NAAQS) has been established for ground level ozone. The ozone NAAQS is 0.075 ppm based on the annual fourth-highest daily maximum 8-hour concentration, averaged over three years. Emissions of oxides of nitrogen (NO_x) and photochemically reactive volatile organic compounds (VOC) contribute to the regional formation of ground level ozone. Under the Prevention of Significant Deterioration (PSD) construction permitting program, new major sources (i.e., potential VOC emissions exceeding 100 tons/year) require an analysis to demonstrate that the ozone NAAQS will not be exceeded by significant impacts due to the project.

To demonstrate that the proposed MS Silicon project will not threaten local ambient air quality by contributing significantly to formation of ground level ozone, potential emissions of NO_x and VOC from the project were summed. A conversion factor was then obtained from a regional ozone study that defined the change in ozone concentration based on the amount of VOC/NO_x emissions associated with the project. The conversion factor was obtained from the State of Wisconsin that identified the potential conversion of VOC/NO_x to ozone. Refer to Exhibit A, Attachment 1 for the backup documentation to support this conversion factor.

Exhibit A - Table 1 shows the potential emissions of VOC/NO_x from the proposed MS Silicon project, the VOC/NO_x to ozone conversion factor, and the estimated increase in ozone concentrations. As shown, the potential increase of VOC/NO_x emissions from the proposed MS Silicon project should not cause an exceedance of the ozone standard.

State of Wisconsin

CORRESPONDENCE/MEMORANDUM

DATE: June 7, 2012

FILE REF: 4530
FID: 459005910

TO: Paul Yeung – AM/7

FROM: John Roth – AM/7

SUBJECT: Ozone Air Quality Analysis for a PSD Permit for Aaarrowcast - Shawano

A. INTRODUCTION

Ozone is a photochemical pollutant that is not generally emitted directly from sources, but is a secondary pollutant created through complex reactions, primarily from volatile organic compounds (VOCs) and oxides of nitrogen (NO_x). This complex chemistry is well understood but has historically presented significant challenges to the designation of particular models for assessing the impacts of individual stationary sources for the formation of this pollutant. Since formation of ozone takes place over tens to hundreds of kilometers downwind from sources, regional models have been developed to simulate ozone levels over large areas. These models have worked well and have been used to develop strategies for reducing VOCs and NO_x in order to attain the ozone ambient air quality standards. Changes from additions of individual sources have not shown any impact in these regional models.

Aarrowcast is proposing to increase their potential emissions relative to their historical actual emissions by 154 tons of VOC and 10 tons of NO_x per year. In addition, a prior PSD permit issued in 2011 increased VOC by 71 tons per year. The analysis set forth below demonstrates that the total increase of emission (235 tons per year potential increase over actual) would not have an effect on the attainment status of the area.

B. POINT SOURCE INVENTORY

Examining the point source emissions in the Shawano County area (Brown, Oconto, Outagamie, Shawano, Waupaca Counties) for 2010, VOC and NO_x emissions account for 13,997 tons per year. Aarrowcast's potential emission increase for both permits and both pollutants would represent 2.4% of the total of NO_x and VOC point source emissions for the region. If other potential ozone precursor emitting sources are included, such as biogenics, area, and on/off road mobile source emissions for this county, this would decrease the percentage of Aarrowcast's overall potential contribution for ozone formation. While production of ozone is not a linear relationship to emissions, analysis of Aarrowcast's emissions demonstrates the impacts of this project will be below detectable levels. Because it will only be emitting less than 2.4% of the emissions for the region, its ozone contribution would be minimal.

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Exhibit A - Attachment 1 - Ozone Analysis Documentation
MS Silicon LLC - Proposed Silicon Manufacturing Plant

	2002	2009	2009 to 2002	2012	2012 to 2002	2018	2018 to 2002
Typical Summer Day Emissions							
VOC	1005	909	-96	878	-127	862	-143
NO_x	1128	747	-381	647	-481	520	-608
Total	2133	1656	-477	1525	-608	1382	-751
Total Year	778545	604440	-174105	556625	-221920	504430	-274115
Modeled Ozone Concentrations (ppb)							
Milwaukee	91.0	84.2	-6.8	82.3	-8.7	78.7	-12.3
Door	91.0	81.8	-9.2	79.3	-11.7	75.2	-15.8
Tons per Day to Result in 1 ppb Change in Ozone							
Milwaukee			70.15		69.89		61.06
Door			51.85		51.97		47.53
Tons per Year to Result in 1 ppb Change in Ozone							
Milwaukee			25604		25508		22286
Door			18924		18968		17349
Change in Ozone (ppb) from 59 Tons Emission							
Milwaukee			0.0023		0.0023		0.0026
Door			0.0031		0.0031		0.0034

State of Wisconsin

CORRESPONDENCE/MEMORANDUM

DATE: November 6, 2012

FILE REF: 4530
FID: 469033840

TO: Paul Yeung – AM/7

FROM: John Roth – AM/7

SUBJECT: Revised Ozone Air Quality Analysis for a PSD Permit for Waupaca Foundry Plant 2/3

A. INTRODUCTION

Ozone is a photochemical pollutant that is not generally emitted directly from sources, but is a secondary pollutant created through complex reactions, primarily from volatile organic compounds (VOCs) and oxides of nitrogen (NO_x). This complex chemistry is well understood but has historically presented significant challenges to the designation of particular models for assessing the impacts of individual stationary sources for the formation of this pollutant. Since formation of ozone takes place over tens to hundreds of kilometers downwind from sources, regional models have been developed to simulate ozone levels over large areas. These models have worked well and have been used to develop strategies for reducing VOCs and NO_x in order to attain the ozone ambient air quality standards. Changes from additions of individual sources have not shown any impact in these regional models.

Waupaca Foundry is proposing to increase their potential emissions relative to their historical actual emissions by 40 tons of VOC and 19 tons of NO_x per year, including a minor source construction permit issued earlier in 2012. The analysis set forth below demonstrates that the total increase of emission (46 tons per year potential increase over actual) would not have an effect on the attainment status of the area.

B. POINT SOURCE INVENTORY

Examining the point source emissions in the Waupaca County area (Brown, Oconto, Outagamie, Shawano, Waupaca Counties) for 2010, VOC and NO_x emissions account for 13,997 tons per year. Waupaca Foundry's potential emission increase for both permits and both pollutants would represent 0.4% of the total of NO_x and VOC point source emissions for the region. If other potential ozone precursor emitting sources are included, such as biogenic, area, and on/off road mobile source emissions for this county, this would decrease the percentage of Waupaca Foundry's overall potential contribution for ozone formation. While production of ozone is not a linear relationship to emissions, analysis of Waupaca Foundry's emissions demonstrates the impacts of this project will be below detectable levels. Because it will be emitting 0.4% of the emissions for the region, its ozone contribution would be minimal.

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C. OZONE MODELING - LADCO

The closest ozone monitors to Waupaca Foundry are those located in Appleton (Outagamie County) and Green Bay (Brown County). Ozone levels at both locations are well below the 2008 NAAQS of 75 parts per billion (ppb). To cause a violation of the 2008 ozone standard this year, the monitors would need to record values 14 to 35 ppb higher than any fourth-high value in the last ten years (2002-2011).

Year	Appleton 4th High (ppb)	Design Value (ppb)	Green Bay 4th High (ppb)	Design Value (ppb)
2002	75	-	84	-
2003	75	-	77	-
2004	71	73	70	77
2005	79	75	79	75
2006	69	73	66	71
2007	75	74	82	75
2008	62	68	63	70
2009	64	67	65	70
2010	62	62	65	64
2011	72	66	65	65
Critical 2012	*94*	*76*	*98*	*76*

The Lake Michigan Air Director Consortium (LADCO) performed photochemical modeling for the region to assess the control strategies to bring the region into attainment. The analysis considered emissions from point, area, and mobile sources and determined the level of reduction in emission to achieve the NAAQS at every monitoring site. The available documentation provides tables showing the impacts at Wisconsin ozone monitors and the emission reduction levels needed to achieve those results. To examine the possible impact of Waupaca Foundry, the Round 4 emissions and modeling reports were reviewed (http://www.ladco.org/reports/control/modeling/).

To provide a range of impact, the total emission reductions within Wisconsin were compared to predicted changes in ozone concentration in Door County (a rural area expected to have limited local VOC reduction) and Milwaukee County (an urban area expected to have greater local VOC reduction). Using this data it is estimated that it takes from 17,349 tons per year to 25,604 tons per year of total VOC and NO_x reductions to result in a 1 ppb reduction in ozone concentration. Therefore, it is assumed that 17,349 to 25,604 tons per year of increased emissions would result in a 1 ppb increase of concentration. Note that this method assumes emission reductions in other areas in the modeling domain do not affect Wisconsin ozone concentrations. This is not actually the case, but results in a conservative estimate of the sensitivity of ozone concentrations to Wisconsin emissions.

Based upon the expected emission increase of 59 tons per year of VOC and NO_x, it is estimated that the increase in ozone concentration is between 0.002 ppb and 0.003 ppb. Considering that an increase of 14 ppb to 35 ppb in ozone concentration is necessary to cause a violation at nearby monitors, it is concluded that the potential increase of 40 tons of VOC and 19 tons of NO_x per year will not cause a violation of the ozone NAAQS.

C. OZONE MODELING - LADCO

The closest ozone monitors to Aarrowcast are those located in Appleton (Outagamie County) and Green Bay (Brown County). Ozone levels at both locations are well below the 2008 NAAQS of 75 parts per billion (ppb). To cause a violation of the 2008 ozone standard this year, the monitors would need to record values 14 to 35 ppb higher than any fourth-high value in the last ten years (2002-2011).

Year	Appleton 4th High (ppb)	Design Value (ppb)	Green Bay 4th High (ppb)	Design Value (ppb)
2002	75	-	84	-
2003	75	-	77	-
2004	71	73	70	77
2005	79	75	79	75
2006	69	73	66	71
2007	75	74	82	75
2008	62	68	63	70
2009	64	67	65	70
2010	62	62	65	64
2011	72	66	65	65
Critical 2012	*94*	*76*	*98*	*76*

The Lake Michigan Air Director Consortium (LADCO) performed photochemical modeling for the region to assess the control strategies to bring the region into attainment. The analysis considered emissions from point, area, and mobile sources and determined the level of reduction in emission to achieve the NAAQS at every monitoring site. The available documentation provides tables showing the impacts at Wisconsin ozone monitors and the emission reduction levels needed to achieve those results. To examine the possible impact of Aarrowcast, the Round 4 emissions and modeling reports were reviewed (http://www.ladco.org/reports/control/modeling/).

To provide a range of impact, the total emission reductions within Wisconsin were compared to predicted changes in ozone concentration in Door County (a rural area expected to have limited local VOC reduction) and Milwaukee County (an urban area expected to have greater local VOC reduction). Using this data it is estimated that it takes from 17,349 tons per year to 25,604 tons per year of total VOC and NO_x reductions to result in a 1 ppb reduction in ozone concentration. Therefore, it is assumed that 17,349 to 25,604 tons per year of increased emissions would result in a 1 ppb increase of concentration. Note that this method assumes emission reductions in other areas in the modeling domain do not affect Wisconsin ozone concentrations. This is not actually the case, but results in a conservative estimate of the sensitivity of ozone concentrations to Wisconsin emissions.

Based upon the expected emission increase of 235 tons per year of VOC and NO_x, it is estimated that the increase in ozone concentration is between 0.009 ppb and 0.014 ppb. Considering that an increase of 14 ppb to 35 ppb in ozone concentration is necessary to cause a violation at nearby monitors, it is concluded that the potential increase of 225 tons of VOC and 10 tons of NO_x per year will not cause a violation of the ozone NAAQS.

Exhibit A - Attachment 1 - Ozone Analysis Documentation
MS Silicon LLC - Proposed Silicon Manufacturing Plant

	2002	2009	2009 to 2002	2012	2012 to 2002	2018	2018 to 2002
Typical Summer Day Emissions							
VOC	1005	909	-96	878	-127	862	-143
NO_x	1128	747	-381	647	-481	520	-608
Total	2133	1656	-477	1525	-608	1382	-751
Total Year	778545	604440	-174105	556625	-221920	504430	-274115
Modeled Ozone Concentrations (ppb)							
Milwaukee	91.0	84.2	-6.8	82.3	-8.7	78.7	-12.3
Door	91.0	81.8	-9.2	79.3	-11.7	75.2	-15.8
Tons per Day to Result in 1 ppb Change in Ozone							
Milwaukee			70.15		69.89		61.06
Door			51.85		51.97		47.53
Tons per Year to Result in 1 ppb Change in Ozone							
Milwaukee			25604		25508		22286
Door			18924		18968		17349
Change in Ozone (ppb) from 235 Tons Emission							
Milwaukee			0.0092		0.0092		0.0105
Door			0.0124		0.0124		0.0135

Exhibit A - Table 1
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential to Emit of Ozone Precursor Compounds

[illegible]	[illegible]	[illegible]	[illegible]
Proposed Silicon Manufacturing Plant	1906.2	93.5	1999.7

*Projected Ozone Emissions (tons/year) = NO_x Emissions + VOC Emissions

[illegible]	[illegible]	[illegible]	[illegible]
1 ppb change per 17,349 tons/year of VOC and NO_x	5.764E-05	1999.7	0.1153

*VOC/NO_x Ozone conversion factor taken from State of Wisconsin Correspondance/Memorandum on November 6, 2012 for Revised Ozone Air Quality Analysis for a PSD Permit for Waupaca Foundry Plant 2/3.

Example Calculation
Conversion Factor = 1 ppb / 17,349 tons/year of VOC/NO_x
Predicted Increase (ppb) = NO_x Emissions (tons/yr) + VOC Emissions (tons/year) * Conversion Factor

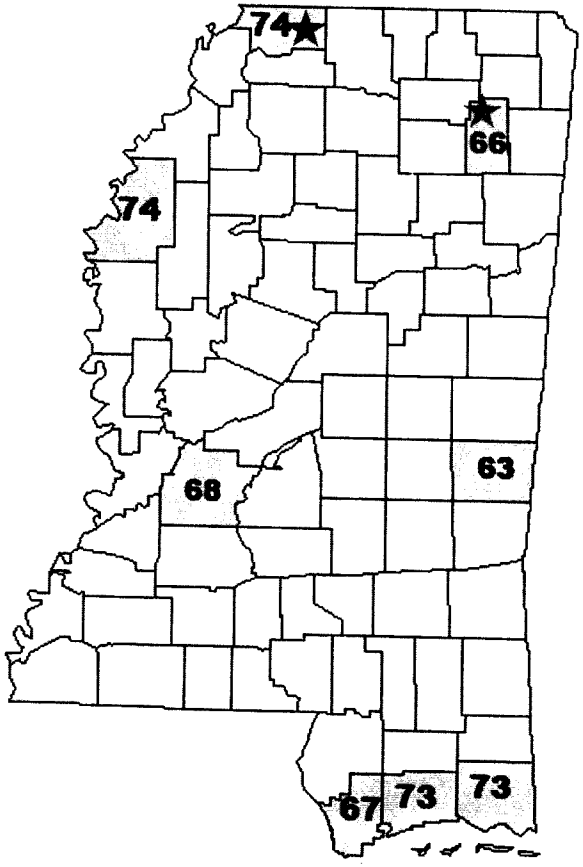
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.00012	0.00012	0.12	74	74.12	75	No

Notes:
*Ozone 8-Hour NAAQS is 75 ppb
**Refer to Figure 1. Concentration based on MDEQ 2012 Air Quality Data Summary

Example Calculations
Predicted Increase (ppm) = Predicted Increase (ppb) / 1000
Projected Concentration (ppm) = Measured Ozone Concentration (ppm) + Predicted Increase (ppm)
Predicted Concentration (ppb) = Projected Concentration (ppm) * 1000
Total Concentration = Predicted.Concentration (ppb) + Existing Ozone Background Concentration (ppb)

County	City	2012 8-Hour Design Values (ppb)
★ DeSoto County	Hernando	74
Bolivar County	Cleveland	74
Hancock County	Waveland	67
Harrison County	Gulfport	73
Hinds County	Jackson	68
Jackson County	Pascagoula	73
Lauderdale County	Meridian	63
★ Lee County	Tupelo	66

Data taken from MDEQ 2012 Air Quality Data summary



★ Location of monitor used to represent proposed plant site

★ The monitor located in Lee County is located near the Tupelo Regional Airport. This airport may affected measurements at the ozone monitor. Because of this potential influence the monitor located in DeSoto County (Hernando) was considered more representative of the proposed project site.

Kennedy/Jenks Consultants

MS Silicon
Proposed Silicon Manufacturing Facility
Tishomingo County, MS

Location of Ozone Monitors – 8-Hour Monitoring Data

1341008*00
October 2013

Exhibit A - Figure 1

Robinson, Donna

From: Bonnie_Grey@deq.state.ms.us
Sent: Wednesday, October 23, 2013 8:32 PM
To: Krivo, Stan
Subject: EPA/MDEQ PSD Draft Permit enReview (Mississippi Silicon LLC)

PSD Notice

The Mississippi Department of Environmental Quality has prepared a draft PSD permit for the facility identified below. A copy of this draft permit and other relevant documents can be viewed using the following link.

Permit No. 2640-00060.

Additional facility information can be viewed at: Mississippi Silicon LLC.

A summary of all PSD applications under review in Mississippi can be viewed at: MDEQ PSD enReview.

Facility Name: Mississippi Silicon LLC
City: Burnsville
County: Tishomingo

Please contact the permit writer, Bonnie Grey ((601) 961-5784 / Bonnie_Grey@deq.state.ms.us), or the branch manager, Marc Wyatt ((601) 961-5367 / Marc_Wyatt@deq.state.ms.us), for additional information or if any of the associated documents are not available.

Recipients: Marc_Wyatt@deq.state.ms.us, adams.yolanda@epamail.epa.gov, ceron.heather@epamail.epa.gov , forney.kathleen@epamail.epa.gov, jacqueline_evans@deq.state.ms.us, krivo.stanley@epamail.epa.gov.

This email was electronically generated on Wed 23-Oct-2013 19:32:21 and is intended to complete the notification requirements under 40 CFR 52.21(p)(1) adopted by reference in Mississippi Commission on Environmental Quality Regulation APC-S-5.

Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Monday, October 21, 2013 12:30 PM
To: Krivo, Stan
Subject: Fw: MS Silicon - Addendum #1 - Multi-Source Air Quality Impact Evaluation
Attachments: KJ_FileVista_PartnerInstruction.pdf

Instructions to download modeling input/output files. Thanks, Jackie

---

Jacqueline Evans
Environmental Permits Division - Modeling Branch
Voice: (601) 961-5163 Fax: (601) 961-5703

MAILING ADDRESS:
Mississippi Department of Environmental Quality
Office Of Pollution Control
PO Box 2261
Jackson, MS 39225

SHIPPING ADDRESS:
Mississippi Department of Environmental Quality
515 E. Amite Street
Jackson, MS 39201

WEB ADDRESS:
www.deq.state.ms.us

----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 10/21/2013 11:27 AM -----

From: "Cameron Ross"
To: ,
Cc: "Steve Frey" ,
Date: 10/10/2013 01:56 PM
Subject: FW: MS Silicon - Addendum #1 - Multi-Source Air Quality Impact Evaluation

[attachment "KJ_FileVista_PartnerInstruction.pdf" deleted by Jacqueline Evans/EPD/OPC/DEQ]
Hi Jacqueline,

Attached is information about our File Vista site, through which the modeling files can be retrieved.

The files are located under San Francisco -> MS Silicon.

Please let me know if you encounter are issues downloading the files.

Best regards,
Cameron

Cameron Ross
Kennedy/Jenks Consultants
Phone: 415.243.2150

From: Steve Frey

Sent: Thursday, October 10, 2013 6:54 AM
To: Bonnie_Morgan@deq.state.ms.us; Jacqueline_Evans@deq.state.ms.us
Cc: Kristin Frey; Karen Thirman; Cameron Ross
Subject: FW: MS Silicon - Addendum #1 - Multi-Source Air Quality Impact Evaluation
Importance: High

Bonnie and Jacqueline

Attached is Addendum #1 to the PSD air permit application submitted by MS Silicon dated August 15,2013. This addendum document contains the multi-source air quality impact evaluation for emissions of PM10, PM2.5, NOx and SO2. The final results from this evaluation show that the proposed MS Silicon plant project will not cause or contribute to an exceedance of the NAAQS.

Please let us know if you have any questions or comments regarding the attached. Also if you need a formal hardcopy version of this document sent to the MDEQ, please let us know.

All supporting modeling files have been placed in a location for direct transfer or downloading by the MDEQ. Cameron Ross from Kennedy/Jenks Consultants will send a separate email this morning providing that information.

Best Regards

Steve

Steven Frey
Manager Air Quality
Kennedy/Jenks Consultants
1515 East Woodfield Road, Suite 360
Schaumburg, Illinois 60173
Office Phone: 847-278-7705
Email: stevefrey@kennedyjenks.com

Kennedy/Jenks Consultants'

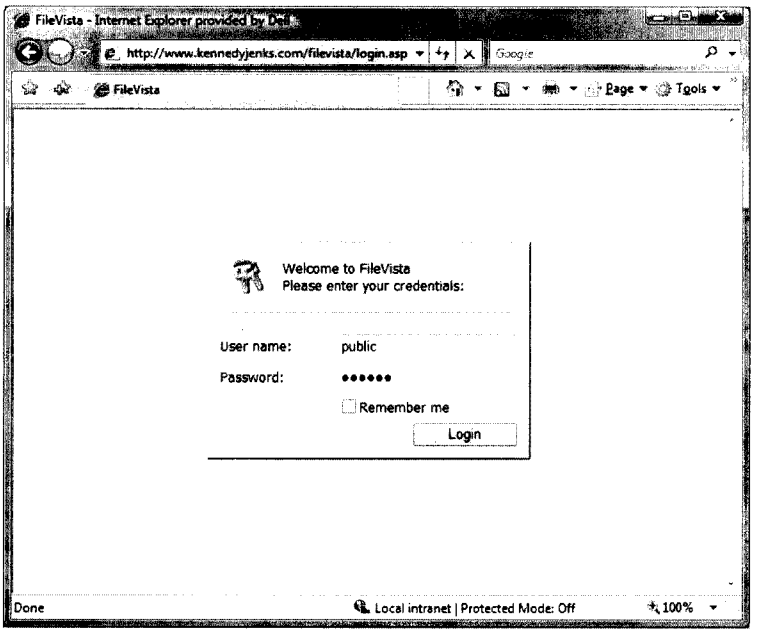
FileVista

FileVista is a web based file manager; basically, it will turn your standard browser into a Windows Explorer-like window. It is an easier way to view and use the K/J FTP server. Upload up to 2GB files (currently the maximum limit of web browsers and IIS).

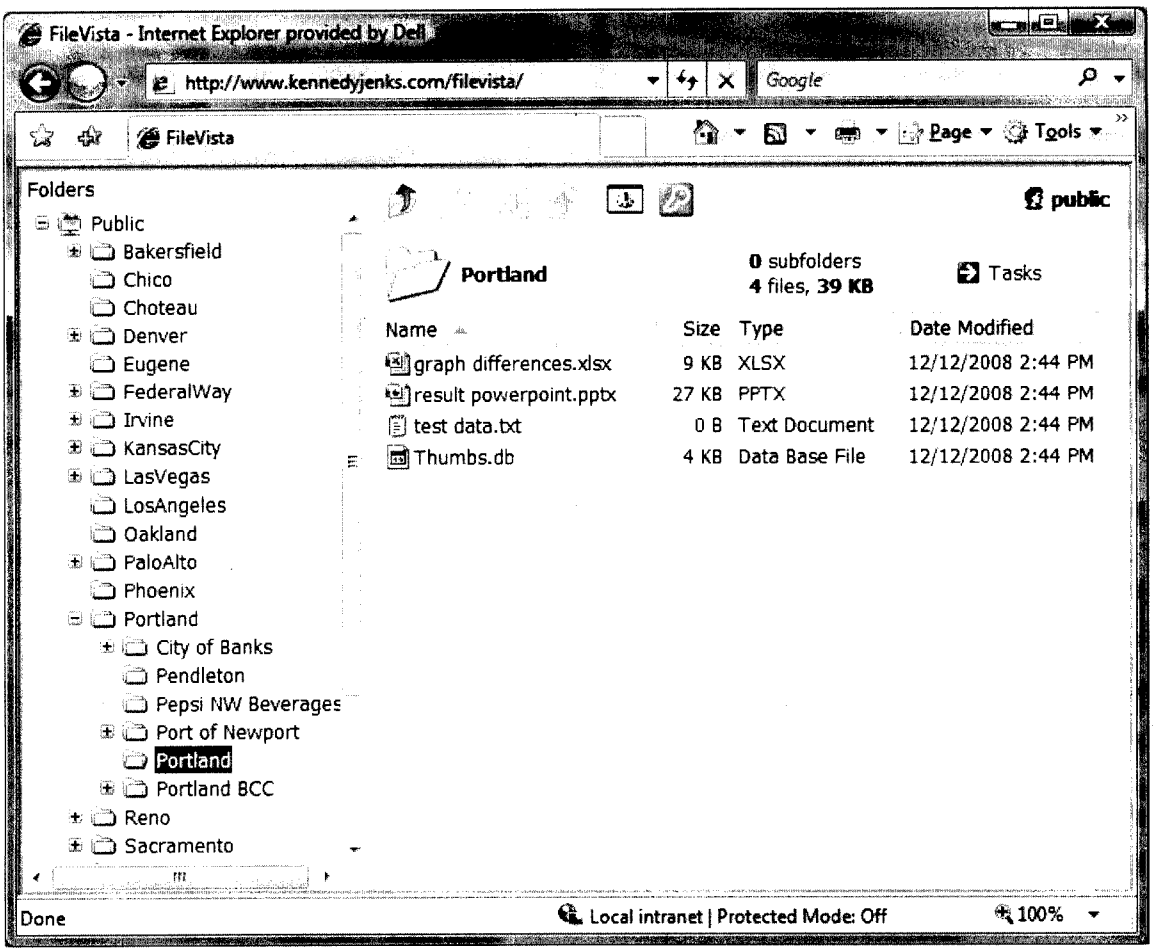
Your K/J contact should provide you with the proper folder to find the files they placed for you to download; or a folder for you to upload your file(s) for your contact to pick up. Be aware that FileVista is a temporary place for "file transfers", not a long-term storage location; your K/J contact should remove files that have been successfully exchanged for confidentiality and data storage purposes. Should the cleanup get overlooked, the system will automatically delete files/folders that are over 14 days old.

To use FileVista:

1) To login, go to: http://www.kennedyjenks.com/filevista/
   User name: public
   Password: lps282

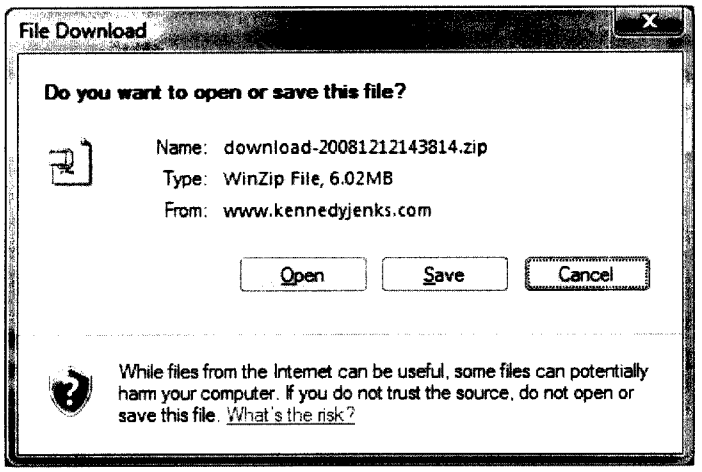


2) **To download a file**, navigate to the specified branch/project folder or file provided by your K/J contact; then select the file or folder you want to download.



Click Download

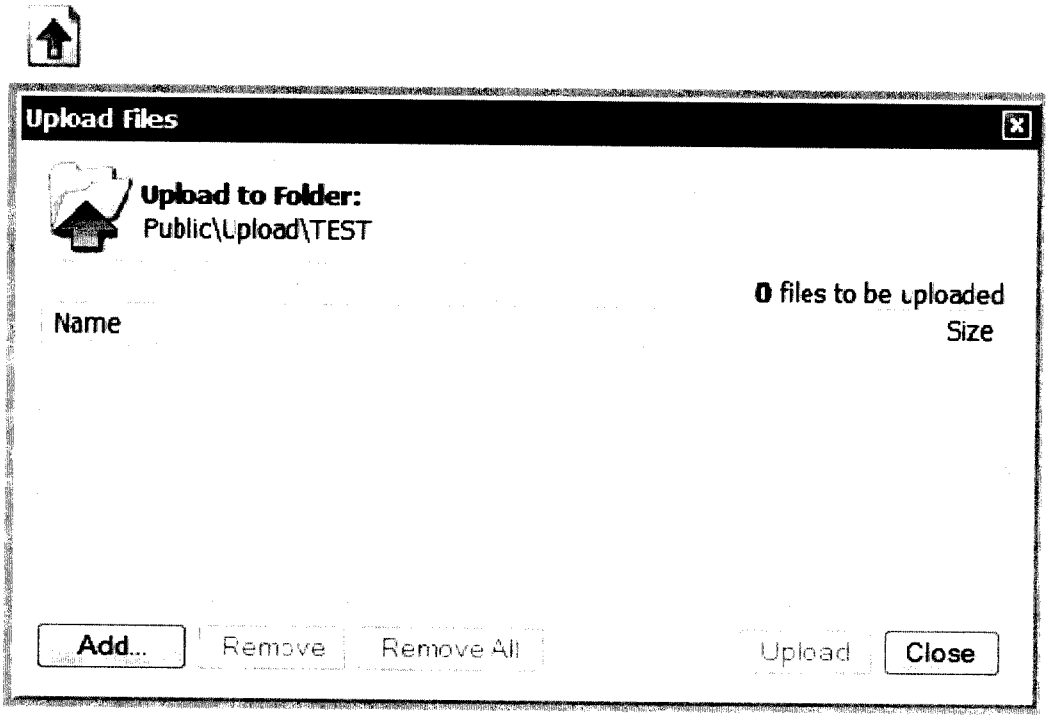
With FileVista you are able to download multiple files (Ctrl-click to select non-contiguous files), or whole folders. Folders/files will download as a .zip file.



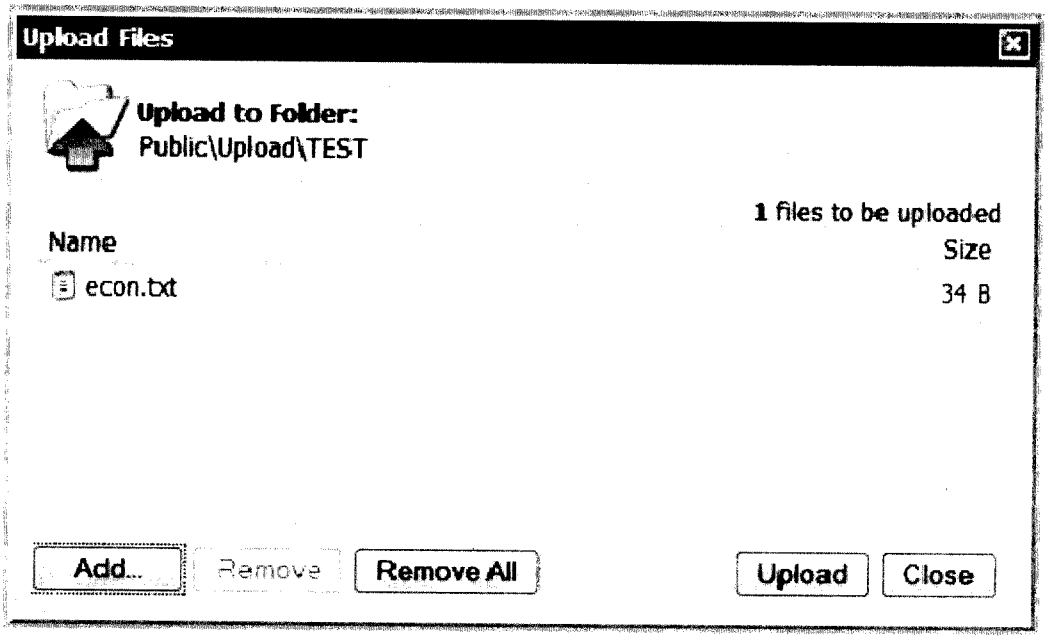
Notify your contact when you have successfully downloaded the file(s) so they can perform the cleanup.

3) **To Upload Files,** navigate to the "Upload" folder, within the Upload folder, find the folder your K/J contact provided.

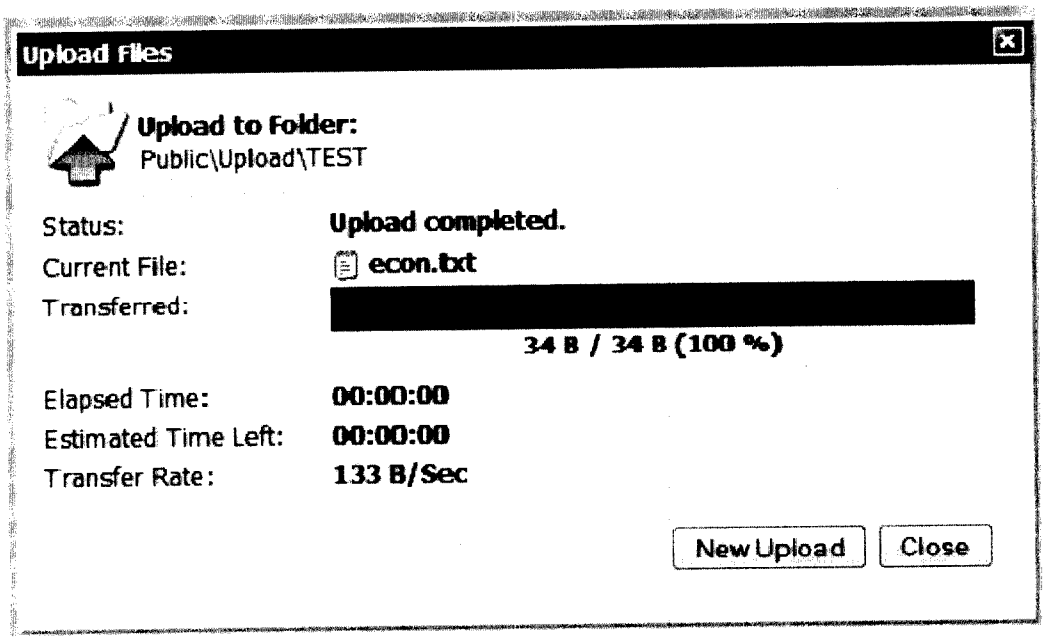
Click on the Upload Icon, the Upload Files window will pop-up. Click the Add... button to browse and select files to upload. You can add multiple files.



Once all the files have been selected click Upload.



A status window will pop up.



Notify your contact that your upload was successful so they can retrieve the file(s) and cleanup the folder.

==========

Requirements:

* Compatible with most of the modern browsers. Currently confirmed browsers:

  Internet Explorer 6.0 and 7.0

  Firefox 1 and 2

  Safari

* Javascript and Cookies should be enabled in the browser.

Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Monday, October 21, 2013 5:02 PM
To: Krivo, Stan
Subject: Fw: Class I Report - Proposed MS Silicon Project

FYI

Jacqueline Evans
Environmental Permits Division - Modeling Branch
Voice: (601) 961-5163 Fax: (601) 961-5703

MAILING ADDRESS:
Mississippi Department of Environmental Quality
Office Of Pollution Control
PO Box 2261
Jackson, MS 39225

SHIPPING ADDRESS:
Mississippi Department of Environmental Quality
515 E. Amite Street
Jackson, MS 39201

WEB ADDRESS:
www.deq.state.ms.us

----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 10/21/2013 04:02 PM -----

From: "Bond, Meredith"
To: , , "Steve Frey" , Tim Allen , "Bret Anderson" , "Jackson, Bill -FS" , Cameron Ross , "Scott Adamson" , Kristin Frey , Karen Thirman , "Forney, Katy" , Ben Mense ,
Date: 10/21/2013 03:18 PM
Subject: RE: Class I Report - Proposed MS Silicon Project

Jacqueline & Bonnie,

Thank you for the phone call on Friday. FWS-Branch of Air Quality had last heard from the applicant's consultants about the Class I AQRV modeling on September 20th - and we didn't see the modeling results or report until this morning (summary conveyed in 10/18/13 late-afternoon e-mail from Steve Frey/Kennedy Jenks, and complete report forwarded by him this morning).

The Class I modeling report mentions in several places that the permit applicant, Mississippi Silicon, has made a commitment to operate no more than two of its four submerged arc furnaces at any given time. (See section 2.1, third paragraph; section 2.2, third paragraph; section 3.3.1 narrative, and footnote to its accompanying Table 3-2.) Using the Q ~ 2,096.4 tons per year figure presented in section 2.2 for this operating scenario, the resulting Q/d ratio for the Mingo Wilderness is reduced to approximately 7.2, below the FLAG 2010 screening threshold of 10.

Based upon the revised operating scenario and resultant emission rates, and the 293 km distance from the Mingo Wilderness, I am screening this project from further AQRV review as regards the FWS-managed Mingo Wilderness area. If the permit will not reflect the emission limitations indicated in the Class I modeling report,

please contact me so we may re-evaluate the project.

At this time, I am also deferring any comments regarding the modeling analyses and methodologies discussed in the report to the Forest Service.

Thank you for involving the Fish and Wildlife Service in this project review.

-- Meredith

CAPT Meredith Bond, P.E., USPHS
Deputy Chief
U.S. Fish and Wildlife Service
Branch of Air Quality
7333 W Jefferson Ave., Suite 375
Lakewood, CO 80235
303-914-3808
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Meredith_Bond@fws.gov

Meteorological Solutions Inc.

October 9, 2013

Mr. Steven Frey
Manager Air Quality
Kennedy/Jenks Consultants
1515 East Woodfield Road, Suite 360
Schaumburg, Illinois 60173

Dear Mr. Frey:

Per our conversation today, please find attached an Executive Summary describing the impacts of Mississippi Silicon emission sources on the Mingo and Sipsey Class I areas.

If you have any questions regarding this report, feel free to contact me.

Sincerely,

Scott Adamson
Meteorologist/Dispersion Modeler

\\MSI_SERVER_2012\msi_server\Msi\Projects\2013\13-68 KennedyJenks Silicon Modeling\MS Silicon Executive Summary Letter.doc

4525 Wasatch Blvd | Suite 200 | SLC UT 84124
Phone 801-272-3000 | Fax 801-272-3040
www.metsolution.com | info@metsolution.com

Meteorological Solutions Inc

Attachment A
PSD Class I Air Quality Analysis Executive Summary

4525 Wasatch Blvd | Suite 200 | SLC UT 84124
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EXECUTIVE SUMMARY

A Prevention of Significant Deterioration (PSD) Class I ambient air quality analysis was conducted for the emission sources associated with Mississippi Silicon, LLC proposed silicon manufacturing plant to be located in Tishomingo County, near the town of Burnsville, Mississippi. The air dispersion modeling analyses were conducted to evaluate the air quality impact on two Class I areas, Sipsey and Mingo Wilderness areas, which are located within a 300 kilometer radius of the proposed plant. The air modeling analyses evaluated the potential air quality impacts on the Sipsey and Mingo Wilderness areas and included the Class I Area Increment and Air Quality Related Values (AQRVs) which evaluated the Class I Significant Impact Levels (SILs), visibility impairment, and sulfate and nitrate deposition impacts.

To perform the Class I area analyses, the CALPUFF Modeling System (CALPUFF (Version 5.8), CALMET (Version 5.8), and CALPOST (Version 6.221)) which is the long range transport model recommended by the draft Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report—Revised (2010), was utilized. CALPUFF is a non-steady state Lagrangian Gaussian puff long-range transport model that includes algorithms for building downwash effects, as well as chemical transformations (important for visibility controlling pollutants), and wet/dry deposition. CALPUFF uses the wind fields generated by CALMET to make the transport and dispersion calculations.

CALMET, the meteorological preprocessor for CALPUFF, is a diagnostic meteorological model that produces three-dimensional wind and temperature fields and two-dimensional fields of other meteorological parameters. The Class I air dispersion modeling analysis was performed using the CALMET dataset which was developed through the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) Best Available Retrofit Technology (BART), commonly referred to as the VISTAS CALMET dataset. The VISTAS CALMET dataset is available for 5 sub domains. The VISTAS CALMET dataset for Sub Domain 1 was utilized for the Sipsey Wilderness Area; sub Domain 3 was utilized for the Mingo Wilderness Area.

The VISTAS CALMET dataset incorporated meteorological surface and upper air as well as precipitation stations which were provided to the CALMET model during processing. Monthly CALMET.DAT files were used for years 2001, 2002, and 2003. Ozone data were extracted using CalPro from a standard ozone dataset associated with the VISTAS CALMET dataset (Sub Domain 1 or 3).

Geophysical data such as terrain and land use is a necessary input to the CALMET model. The geophysical data utilized was included as part of the VISTAS CALMET dataset.

POSTUTIL (Version 1.56), a program that transforms particle size species to new species and produces the necessary concentration files that are then used by CALPOST for post-processing of results, was used for these analyses. The CALPOST model was used to calculate the concentration results for comparison to the modeling significance levels and the deposition flux for total sulfur and nitrogen. CALPOST was also used to carry out the visibility analysis. The CALPUFF modeling system switch settings and model options were based a combination of Interagency Workgroup on Air Quality Modeling (IWAQM) recommended switch settings and successive switch settings recommended in the Federal Land Managers (FLM) CALPUFF Reviewer's guide-FNL-20110523.

The air dispersion modeling analysis evaluated the potential impact of the emissions from proposed silicon manufacturing plant. Emission data and source characteristic information for the proposed silicon manufacturing plant were provided by Kennedy Jenks. Point, area, and volume sources were included in the model. Discrete receptors for Sipsey and Mingo Wilderness areas, downloaded from the National Park Service (NPS) web site at http://www.nature.nps.gov/air/maps/receptors/index.cfm were used to calculate air quality and visibility impacts.

The maximum concentrations of SO_2, NO_2, PM_{10}, and $PM_{2.5}$ at the Sipsey and Mingo Wilderness Areas were compared with Class I Significant Impact Levels (SILs). According to guidance, if maximum concentrations are below the SILs, then emissions from the facility are assumed to be insignificant and no further analysis is needed. Tables E-1 and E-2 present the results of the air dispersion modeling analysis for the Mississippi Silicon, LLC facility and compares the modeled concentrations at Sipsey and Mingo, respectively, to the Class I SILs. With the exception of three-hour and 24-hour SO_2 concentrations for 2001 and 2003, results indicate that all modeled concentrations are well below the SILs. For pollutant concentrations below the SIL, the emissions from the Mississippi Silicon, LLC facility are assumed to be insignificant which means that emissions from the proposed facility will not have the potential to cause or contribute to an exceedance of an ambient air quality standard or PSD increment. At this time the Mississippi Department of Environmental Quality (MDEQ) and FLM's have not required a cumulative increment analysis to be conducted.

Table E-1

CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Sipsey Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (µg/m³)			SIL Class I Significant Impact Levels (µg/m³)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.8775	0.5986	**1.2454**	1.0	**124.5**
	3-hour (H2H)	0.6231	0.5672	0.9001	1.0	90.0
	24-hour (H1H)	**0.2371**	0.1958	**0.2551**	0.2	**127.5**
	24-hour (H2H)	0.1548	0.1947	**0.2235**	0.2	**111.7**
	Annual (H1H)	0.0074	0.0082	0.0104	0.1	10.4
NO_2	Annual (H1H)	0.0050	0.0058	0.0070	0.1	7.0
PM_{10}	24-hour (H1H)	0.0071	0.0046	0.0044	0.3	2.4
	24-hour (H2H)	0.0050	0.0031	0.0041	0.3	1.7
	Annual (H1H)	0.0002	0.0002	0.0002	0.2	0.11
$PM_{2.5}$	24-hour (H1H)	0.0139	0.0077	0.0081	0.07	19.8
	24-hour (H2H)	0.0074	0.0074	0.0072	0.07	10.62
	Annual (H1H)	0.0004	0.0003	0.0004	0.06	0.73

Table E-2

CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Mingo Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (µg/m3)			SIL Class I Significant Impact Levels (µg/m³)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.0798	0.2387	0.1317	1.0	23.9
	3-hour (H2H)	0.0636	0.1173	0.0794	1.0	11.7
	24-hour (H1H)	0.0243	0.0563	0.0305	0.2	28.1
	24-hour (H2H)	0.0401	0.0313	0.0252	0.2	20.1
	Annual (H1H)	0.0006	0.0008	0.0008	0.1	0.85
NO_2	Annual (H1H)	0.0004	0.0002	0.0003	0.1	0.36
PM_{10}	24-hour (H1H)	0.0004	0.0011	0.0007	0.3	0.36
	24-hour (H2H)	0.0003	0.0006	0.0006	0.3	0.21
	Annual (H1H)	0.0000	0.0000	0.0000	0.2	0.01
$PM_{2.5}$	24-hour (H1H)	0.0012	0.0019	0.0020	0.07	2.9
	24-hour (H2H)	0.0010	0.0014	0.0019	0.07	2.7
	Annual (H1H)	0.0000	0.0000	0.0000	0.06	0.07

A visibility impairment analysis was conducted in order to determine if the Mississippi Silicon, LLC facility would have an adverse impact on visibility at the Sipsey and Mingo Wilderness Areas. The analysis was done using the CALPOST following the methods and options outlined under the FLAG 2010 guidance with MVISBK = 8 and the background light extinction based on the "cleanest 20%" days for each wilderness area. The visibility threshold is exceeded if the predicted change in light extinction exceeds 5% based on the 98th percentile (eighth highest day for a year) in any single year modeled. The CALPUFF/CALPOST visibility results for the Mississippi Silicon, LLC facility were compared to the "cleanest 20%" background and were found to be below the 5% (based on the 98th percentile calculation) for the cleanest 20% background condition. These results for Sipsey and Mingo Wilderness areas are presented in Tables E-3 and E-4, respectively.

Table E-3

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Sipsey Wilderness Areas

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	3.03%	3.20%	2.35%	64.0
2	2.90%	2.97%	2.19%	59.4
3	2.60%	2.41%	2.07%	52.0
4	2.54%	1.69%	1.98%	50.8
5	2.41%	1.68%	1.95%	48.2
6	2.13%	1.61%	1.95%	42.6
7	1.97%	1.59%	1.64%	39.4
8	1.69%	1.41%	1.58%	33.8

Table E-4

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Mingo Wilderness Areas

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	1.04%	0.46%	1.06%	21.2
2	0.55%	0.39%	0.99%	19.8
3	0.54%	0.37%	0.91%	18.2
4	0.52%	0.35%	0.70%	14
5	0.44%	0.29%	0.66%	13.2
6	0.37%	0.28%	0.51%	10.2
7	0.34%	0.25%	0.44%	8.8
8	0.30%	0.24%	0.34%	6.8

Total sulfur and total nitrogen deposition analyses were performed for Sipsey and Mingo Wilderness areas. For the deposition analysis, POSTUTIL was used to combine the wet and dry flux output files from CALPUFF and scale the contributions of SO_2, SO_4, NO_x, NO_3, and HNO_3 such that total nitrogen (N) and total sulfur (S) flux were contained in the same file. The model results were compared to the 0.01 kg/ha/year Deposition Analysis Threshold (DAT) developed by the NPS and the U.S. Fish and Wildlife Service (FWS) for the Eastern Class I Areas. The results of this analysis are provided in E-5 and E-6 for Sipsey and Mingo, respectively.

Table E-5

Sulfur and Nitrogen Deposition Flux Results for Sipsey Wilderness Area

Pollutant	Total Modeled Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0068	0.0087	0.0087	0.01	87.1
Nitrogen (N)	0.0028	0.0036	0.0037	0.005	73.1

Table E-6

Sulfur and Nitrogen Deposition Flux Results for Mingo Wilderness Area

Pollutant	Total Modeled Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0010	0.0010	0.0016	0.01	16.4
Nitrogen (N)	0.0005	0.0004	0.0007	0.005	14.8

Mississippi Silicon Class I SIL Analysis

SIL Analysis with visibility and deposition chemical transformation turned off in CALPUFF

Mingo

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (ug/m3)			SIL Class I Significant Impact Levels (ug/m3)	Maximum Percent of SIL
		2001	2002	2003		
SO2	3-hour (H1H)	0.3954	0.2921	0.3945	1.0	39.5%
	3-hour (H2H)	0.3723	0.3467	0.3858	1.0	37.2%
	24-hour (H1H)	0.1569	0.0741	0.0679	0.2	78.5%
	24-hour (H2H)	0.0585	0.0480	0.0636	0.2	31.8%
	Annual (H1H)	0.0022	0.0018	0.0023	0.1	2.3%
NO2	Annual (H1H)	0.0020	0.0016	0.0021	0.1	2.1%
PM10	24-hour (H1H)	0.0066	0.0021	0.0026	0.3	2.2%
	24-hour (H2H)	0.0025	0.0017	0.0025	0.3	0.8%
	Annual (H1H)	0.000094	0.000068	0.000096	0.2	0.0%
PM2.5	24-hour (H1H)	0.0056	0.0020	0.0022	0.07	8.0%
	24-hour (H2H)	0.0021	0.0015	0.0022	0.07	3.2%
	Annual (H1H)	0.000081	0.000060	0.000083	0.06	0.1%

Sipsey

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (ug/m3)			SIL Class I Significant Impact Levels (ug/m3)	Maximum Percent of SIL
		2001	2002	2003		
SO2	3-hour (H1H)	1.2540	1.0530	1.4150	1.0	141.6%
	3-hour (H2H)	1.1071	0.8076	0.9714	1.0	110.7%
	24-hour (H1H)	0.2848	0.2531	0.3142	0.2	157.1%
	24-hour (H2H)	0.2450	0.2335	0.2622	0.2	131.1%
	Annual (H1H)	0.0121	0.0130	0.0157	0.1	15.7%
NO2	Annual (H1H)	0.0106	0.0115	0.0139	0.1	13.9%
PM10	24-hour (H1H)	0.0178	0.0097	0.0100	0.3	5.9%
	24-hour (H2H)	0.0096	0.0091	0.0094	0.3	3.2%
	Annual (H1H)	0.0005	0.0005	0.0006	0.2	0.3%
PM2.5	24-hour (H1H)	0.0141	0.0085	0.0088	0.07	20.1%
	24-hour (H2H)	0.0075	0.0080	0.0082	0.07	11.7%
	Annual (H1H)	0.0004	0.0004	0.0006	0.06	0.9%

Table 3-5
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
$PM_{10}/PM_{2.5}$ Predicted Concentrations Compared to NAAQS - Multi-Source Modeling

Pollutant	Averaging Period	Year	Concentration	Date	UTM East	UTM North	Background	Total	NAAQS	Description	Exceedance
PM_{10}	24-hour*	2007	20.48	07/18/05/24	378671.74	3851193.81	46	66.48	150	Sixth highest over 5 years (the NAAQS is not to be exceeded more than once per year on average)	No
		2008	19.04	08/28/05/24	378645.00	3851529.00	46	65.04			No
		2009	16.82	09/08/05/24	378739.55	3851768.56	46	62.82			No
		2010	16.94	10/07/04/24	378810.99	3852298.80	46	62.94			No
		2011	14.84	11/30/20/24	379945.00	3851920.80	46	60.84			No
		2007 - 2011	20.48	07/18/05/24	378671.74	3852193.81	46	66.48			No
$PM_{2.5}$	24-hour**	2007	6.61	–	378852.62	3852333.27	18.5	25.13	35	Average of the eighth highest (98th percentile) from each year	No
		2008	6.03	–	378837.69	3851766.78	18.5	24.53			No
		2009	6.07	–	378690.48	3851769.45	18.5	24.57			No
		2010	5.68	–	378739.55	3851768.56	18.5	24.18			No
		2011	5.69	–	378690.48	3851769.45	18.5	24.19			No
		2007 - 2011	5.68	–	378852.62	3852321.27	18.5	24.18			No
	Annual***	2007	2.03	–	378852.62	3852333.27	9.65	11.68	12	Average of the highest from each year	No
		2008	1.72	–	378852.62	3852333.27	9.65	11.37			No
		2009	1.65	–	379000.41	3852321.36	9.65	11.30			No
		2010	1.68	–	378810.99	3852298.80	9.65	11.31			No
		2011	1.89	–	379000.41	3852321.36	9.65	11.54			No
		2007 - 2011	1.55	–	379000.41	3852321.36	9.65	11.20			No

Notes:

*PM_{10} 24-Hour modeled concentrations based on high 1st high values

**$PM_{2.5}$ 24-Hour modeled concentrations based on 8th highest 24-hr results averaged over 1 year

***$PM_{2.5}$ Annual modeled concentrations based on maximum annual results averaged over 1 year

Table 3-7d
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
NO_2 Predicted Concentrations Compared to NAAQS - Multi-Source Modeling

NO_2 - Annual

Pollutant	Averaging Period	Year	Modeled Concentration	Background Concentration	UTM East (m)	UTM North (m)	Total Concentration	Percent of NAAQS	Percent Significant Impact Area	Compliance Method	Compliance Demonstrated
NO_2	Annual	2007	3.38	-	378808.00	3852372.60	7.52	10.80	100	Average of the highest from each year	No
		2008	2.63	-	378901.88	3852372.60	7.52	10.15			No
		2009	2.89	-	378918.67	3851720.72	7.52	10.32			No
		2010	3.01	-	378778.55	3851768.56	7.52	10.33			No
		2011	3.19	-	378049.81	3852370.72	7.52	10.65			No
		2007 - 2011	-	-	-	-	-	-			-

Step 1 - NO_2 1-Hour - Full 50 km Grid

Pollutant	Averaging Period	Year	Modeled Concentration	Background Concentration	UTM East (m)	UTM North (m)	Total Concentration	Percent of NAAQS	Percent Significant Impact Area	Compliance Method	Compliance Demonstrated
NO_2	1-Hour	2011	895.24	-	372965.00	3866020.00	63.92	959.16	108	Average of the eighth highest (98th percentile) maximum daily 1-hour concentration from each year	Yes

*Based on 1st-highest max daily 1-hr results

Step 2 - NO_2 1-Hour - Significant Impact Area (SIA) Only

Pollutant	Averaging Period	Year	Modeled Concentration	Background Concentration	UTM East (m)	UTM North (m)	Total Concentration	Percent of NAAQS	Percent Significant Impact Area	Compliance Method	Compliance Demonstrated
NO_2	1-Hour	2011	454.13	11/02/11/02	412485.00	3866020.00	63.92	518.05	108	Average of the eighth highest (98th percentile) maximum daily 1-hour concentration from each year	Yes

*Based on 1st-highest max daily 1-hr results

Step 3 - NO_2 1-Hour - Identified Two (2) Critical Receptors. Re-Modeled All Sources on Critical Receptors (Meteorological Data Period - 2011)

Pollutant	Averaging Period	Year	Modeled Concentration	Background Concentration	UTM East (m)	UTM North (m)	Total Concentration	Percent of NAAQS	Percent Significant Impact Area	Compliance Method	Compliance Demonstrated
SRCGP1 - All Sources			454.13				383.56				
SRCGP2 - Columbia Gulf Transmission			38.48				32.56				
SRCGP3 - Kingsford Manufacturing Company			0.71				0.87				
SRCGP4 - Tiffin Motorhomes Inc			21.18				23.32				
SRCGP5 - Oil Dri Production Company			6.38				6.41				
SRCGP6 - TVA Magnolia Combined Cycle			1.56				1.54				
SRCGP7 - Cherokee Nitrogen Company			[illegible]				368.38				
SRCGP8 - TX Eastern Transmission			11.37				11.89				
SRCGP9 - TVA Colbert			20.99				21.72				
SRCGP10 - MS Silicon			4.31				4.31				
SRCGP11 - Packaging Corporation of America			5.13				6.27				
SRCGP12 - Wise Alloys Plant			43.94				44.03				

*Based on 1st-highest max daily 1-hr results

Table 3-7d
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
NO_2 Predicted Concentrations Compared to NAAQS - Multi-Source Modeling

Step 4 - NO_2 1-Hour - Critical Receptors. All Sources (Excludes Cherokee Nitrogen)

NO_2	1-Hour	2011	240.35	11/12/27/24	372968.00	3864030.00

*Based on 1st-highest max daily 1-hr results

Step 5 - NO_2 1-Hour - Critical Receptors and Source Culpabilities (Meteorological Data Period - 2011)

SRCGP1 - All Sources	160.78	163.98	235.55	241.76	157.08	210.64
SRCGP2 - Columbia Gulf Transmission	12.14	7.86	235.41	241.62	156.91	210.03
SRCGP3 - Kingsford Manufacturing Company	1.89	2.30	3.55	4.14	4.02	2.08
SRCGP4 - Tiffin Motorhomes Inc	15.47	10.56	10.77	12.29	10.84	9.92
SRCGP5 - Oil Dri Production Company	2.95	2.34	7.87	8.41	7.63	7.45
SRCGP6 - TVA Magnolia Combined Cycle	1.81	2.38	2.39	2.67	2.62	2.36
SRCGP7 - Cherokee Nitrogen Company	31.57	21.41	34.03	32.77	39.66	43.34
SRCGP8 - TX Eastern Transmission	5.44	5.49	2.96	2.13	2.58	2.79
SRCGP9 - TVA Colbert	15.83	14.83	4.42	5.18	4.83	6.84
SRCGP10 - MS Silicon	5.68	8.02	12.44	14.83	11.81	9.03
SRCGP11 - Packaging Corporation of America	14.71	15.89	11.35	18.46	13.40	16.28
SRCGP12 -Wise Alloys Plant	190.35	163.54	17.92	18.11	12.76	17.91

*Based on 1st-highest max daily 1-hr results

Step 6 - NO_2 1-Hour - 2 km Grid with Various Source Groups

SRCGP1 - All Sources	112.15	377565.00	3854030.00
SRCGP2 - Columbia Gulf Transmission	111.85	377565.00	3854030.00
SRCGP3 - All Sources Excluding Columbia Gulf	86.67	378453.08	3852095.12

*Based on 1st-highest max daily 1-hr results

Table 2-5
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to PSD Class II Increments - Based on Four (4) Submerged Arc Furnaces Operating Simultaneously

PM_{10}	24-hour	2007	16.07	07/08/09/24	379363.47	3852190.55	30	Highest of the second high from each of the 5 years	No
		2008	16.68	08/09/22/24	378565.00	3851520.00			No
		2009	14.46	09/09/23/24	378665.00	3852120.00			No
		2010	13.96	10/08/31/24	378852.62	3852323.27			No
		2011	13.49	11/08/22/24	378739.55	3851768.56			No
		2007 - 2011	16.68	--	378565.00	3851520.00			No
	Annual	2007	3.53	--	378852.62	3852323.27	17	Highest of the 5 years	No
		2008	2.98	--	378852.62	3852323.27			No
		2009	3.25	--	379000.41	3852321.36			No
		2010	3.25	--	379000.41	3852321.3			No
		2011	3.59	--	379049.67	3852320.72			No
		2007 - 2011	--	--	--	--			--
$PM_{2.5}$	24-hour	2007	7.55	07/07/16/24	378852.62	3852323.27	9	Highest of the second high from each of the 5 years	No
		2008	7.17	08/09/22/24	378565.00	3851620.00			No
		2009	7.12	09/11/23/24	378852.62	3852323.27			No
		2010	7.82	10/08/30/24	378810.99	3852298.80			No
		2011	6.74	11/11/06/24	378852.62	3852323.27			No
		2007 - 2011	7.06	--	378852.62	3852323.27			No
	Annual	2007	1.94	--	378852.62	3852323.27	4	Highest of the 5 years	No
		2008	1.66	--	378852.62	3852323.27			No
		2009	1.62	--	379000.41	3852321.36			No
		2010	1.61	--	379000.41	3852321.36			No
		2011	1.86	--	379000.41	3852321.36			No
		2007 - 2011	--	--	--	--			--
NO_2	Annual	2007	6.19	--	378886.76	3851765.89	25	Highest of the 5 years	No
		2008	4.57	--	378886.76	3851765.89			No
		2009	4.96	--	378788.67	3851767.67			No
		2010	5.48	--	378788.62	3851767.67			No
		2011	5.02	--	378788.62	3851767.67			No
		2007 - 2011	--	--	--	--			--
SO_2**	3-hour	2007	67.24	07/08/11/12	378865.00	3851420.00	512	Highest of the second high from each of the 5 years	No
		2008	62.72	08/07/17/12	378765.00	3852720.00			No
		2009	64.54	09/10/19/12	379165.00	3852620.00			No
		2010	66.90	10/08/06/15	379065.00	3852620.00			No
		2011	65.39	11/10/25/15	379265.00	3852620.00			No
		2007 - 2011	68.89	--	379065.00	3852520.00			No
	24-hour	2007	25.40	07/07/18/24	378365.00	3852720.00	91	Highest of the second high from each of the 5 years	No
		2008	25.45	08/08/07/24	378965.00	3852720.00			No
		2009	26.02	09/06/28/24	379465.00	3851620.00			No
		2010	24.85	10/07/03/24	379165.00	3852820.00			No
		2011	23.89	11/09/16/24	378565.00	3851420.00			No
		2007 - 2011	29.33	--	379665.00	3852120.00			No
	Annual	2007	4.79	--	378965.00	3852720.00	20	Highest of the 5 years	No
		2008	3.39	--	378865.00	3852920.00			No
		2009	3.47	--	379365.00	3852820.00			No
		2010	4.13	--	379265.00	3852720.00			No
		2011	4.00	--	379365.00	3852820.00			No
		2007 - 2011	--	--	--	--			--

Notes:

*Proposed MS Silicon project will trigger the PSD minor source baseline date for Tishomingo County. As a result, MS Silicon is the only Class II increment consuming source for the regulated air pollutants PM_{10}, $PM_{2.5}$ and NO_2

**The minor source baseline date for SO_2 has already been set for the counties surrounding Tishomingo. There is only one other existing SO_2 source that consumes the increment. The predicted concentration for SO_2 reflects impacts from MS Silicon and Kingsford Manufacturing Company.

Robinson, Donna

Release - MDEQ

From: Jacqueline_Evans@deq.state.ms.us
Sent: Thursday, October 24, 2013 9:38 AM
To: Krivo, Stan; Monteith, Richard
Subject: Fw: NO2 Mutlisource including culpability analysis

Good morning Stan, Richard

Have a question for you. Following our conference call with Mississippi Silicon, Steve reran the model and continued to get a modeled violation for the 1-hour NAAQS. Steve and I discussed it and I suggested that he use the NAAQS contribution option to show MS Silicon's contribution to the modeled violation. Instead of doing that, he provided the following explanation. We (he and I) went over it together, but I am still having trouble grasping what he has done. Is this acceptable for a culpability analysis? Would like your input. Thanks, Jackie

---

Jacqueline Evans
Environmental Permits Division - Modeling Branch
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WEB ADDRESS:
www.deq.state.ms.us

----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 10/24/2013 08:24 AM -----

From: "Steve Frey"
To: , ,
Date: 10/23/2013 03:05 PM
Subject: NO2 Mutlisource including culpability analysis

Provided below is the 1-hour multisource NO2 impact (8th highest) for all sources. The background concentration is 63.9 ug/m3. The results provided in this table are reflective of the worst case year based on the initial modeling. Other years are still running but should show similar results since certain existing sources dominate the predicted concentrations.

1) The values below need to be multiplied by EPA Tier II conversion of 0.8. Thus 180.4 becomes 144.32. Adding a background of 63.9 results in a total of 208.22 above the 1-hor NO2 NAAQS. However modeling that one receptor point for every hour in the year shows that the impact from MS Silicon is around 5.5 ug/m3 well below the SIL of 7.52ug/m3.

2) We look at each of the top ten highest concentrations in the table below and for each concentration MS silicon impacts result in predicted concentrations of less than 5.5 ug/m3, well below the SIL of 7.5 ug./m3. To obtained these results we have group the proposed plant as a separate group within the model run. Thus it is easy to go back and check that group to see what the worst case concentration was at that receptor based on predicted concentrations for the entire year.

3) A conservative approach to looking at the results is to take the 10 highest concentration and multiply by 0.8 and then add the background concentration. This results in a predicted multisource concentration of 108.51 X 0.8 = 86.8 ug/m3 + a background of 63.9 to get a total of 150.7 ug/m3 which is well below the 1-hour NO2 NAAQS of 188 ug/m3

4) Since it appears the results are being biased by several existing sources and the proposed plant has an insignificant impact on those specific hot spots and to account for any variation from year to year, the maximum 1-hou impact (highest predicted concentration)from the plant can be used and then add the representative background concentration. This would be 119.77 in calendar year 2008. Add the background of 63.9 and you get a total of 183.67 ug/m3 also below the 1-hour NO2 of NAAQS of 188 ug/m3.

Additional model runs are still going, thus the approach provided for item 4 above should account for any year to year variation where you look at the 8th highest versus the highest stated above

Steve

**MODELOPTs: RegDFAULT CONC ELEV

*** THE SUMMARY OF MAXIMUM 8TH-HIGHEST MAX DAILY 1-HR RESULTS AVERAGED OVER 1 YEARS ***

** CONC OF NO2 IN MICROGRAMS/M**3 **

NETWORK
GROUP ID AVERAGE CONC RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) OF TYPE GRID-ID

SRCGP1 1ST HIGHEST VALUE IS 180.41076 AT (372965.00, 3866020.00, 181.48, 181.48, 0.00) DC
2ND HIGHEST VALUE IS 167.02731 AT (408965.00, 3837020.00, 210.60, 248.60, 0.00) DC
3RD HIGHEST VALUE IS 154.00159 AT (370965.00, 3866020.00, 178.76, 178.76, 0.00) DC
4TH HIGHEST VALUE IS 152.61029 AT (370965.00, 3864020.00, 181.07, 181.07, 0.00) DC
5TH HIGHEST VALUE IS 152.02898 AT (403965.00, 3842020.00, 215.63, 232.60, 0.00) DC
6TH HIGHEST VALUE IS 137.85737 AT (423965.00, 3842020.00, 206.35, 231.00, 0.00) DC
7TH HIGHEST VALUE IS 134.48482 AT (380965.00, 3870020.00, 196.26, 196.26, 0.00) DC
8TH HIGHEST VALUE IS 121.71853 AT (418965.00, 3862020.00, 193.89, 193.89, 0.00) DC
9TH HIGHEST VALUE IS 121.45998 AT (418965.00, 3832020.00, 215.32, 275.60, 0.00) DC
10TH HIGHEST VALUE IS 108.50979 AT (368965.00, 3862020.00, 181.00, 181.00, 0.00) DC

Steven Frey
Manager Air Quality
Kennedy/Jenks Consultants
1515 East Woodfield Road, Suite 360
Schaumburg, Illinois 60173
Office Phone: 847-278-7705
Email: stevefrey@kennedyjenks.com

Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Tuesday, November 12, 2013 2:19 PM
To: Krivo, Stan
Subject: Fw: NO2 Mutlisource including culpability analysis - Email #3

Jacqueline Evans
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www.deq.state.ms.us

----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 11/12/2013 01:18 PM -----

From: "Steve Frey"
To: , ,
Date: 10/23/2013 03:05 PM
Subject: NO2 Mutlisource including culpability analysis

Provided below is the 1-hour multisource NO2 impact (8th highest) for all sources. The background concentration is 63.9 ug/m3. The results provided in this table are reflective of the worst case year based on the initial modeling. Other years are still running but should show similar results since certain existing sources dominate the predicted concentrations.

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3) A conservative approach to looking at the results is to take the 10 highest concentration and multiply by 0.8 and then add the background concentration. This results in a predicted multisource concentration of 108.51 X 0.8 = 86.8 ug/m3 + a background of 63.9 to get a total of 150.7 ug/m3 which is well below the 1-hour NO2 NAAQS of 188 ug/m3

4) Since it appears the results are being biased by several existing sources and the proposed plant has an insignificant impact on those specific hot spots and to account for any variation from year to year, the maximum 1-hou impact (highest predicted

concentration)from the plant can be used and then add the representative background concentration. This would be 119.77 in calendar year 2008. Add the background of 63.9 and you get a total of 183.67 ug/m3 also below the 1-hour NO2 of NAAQS of 188 ug/m3.

Additional model runs are still going, thus the approach provided for item 4 above should account for any year to year variation where you look at the 8th highest versus the highest stated above

Steve

**MODELOPTs: RegDFAULT CONC ELEV

*** THE SUMMARY OF MAXIMUM 8TH-HIGHEST MAX DAILY 1-HR RESULTS AVERAGED OVER 1 YEARS ***

** CONC OF NO2 IN MICROGRAMS/M**3 **

NETWORK
GROUP ID AVERAGE CONC RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG) OF TYPE GRID-ID

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Robinson, Donna

From: Jacqueline_Evans@deq.state.ms.us
Sent: Tuesday, November 12, 2013 2:31 PM
To: Krivo, Stan
Subject: Fw: SO2 Analysis with Kingsford - Email #7
Attachments: ATT00001.txt

Jacqueline Evans
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----- Forwarded by Jacqueline Evans/EPD/OPC/DEQ on 11/12/2013 01:30 PM -----

From: "Cameron Ross"
To: "Steve Frey" ,
Cc: ,
Date: 10/23/2013 11:05 AM
Subject: RE: SO2 Analysis with Kingsford

[attachment "MSS and KMC Results.zip" deleted by Jacqueline Evans/EPD/OPC/DEQ]
Please see attached modeling result files.

Cameron Ross
Kennedy/Jenks Consultants
Phone: 415.243.2150

From: Steve Frey
Sent: Wednesday, October 23, 2013 8:57 AM
To: Cameron Ross
Cc: Jacqueline_Evans@deq.state.ms.us; Bonnie_Morgan@deq.state.ms.us
Subject: SO2 Analysis with Kingsford

Cameron,

Can you send the modeling we did early this week where we looked at MS silicon with Kingsford in the revised SO2 impact analysis for the PSD Class II increment.
Please send ASAP

Thanks

Steve

Steven Frey
Manager Air Quality
Kennedy/Jenks Consultants
1515 East Woodfield Road, Suite 360
Schaumburg, Illinois 60173
Office Phone: 847-278-7705
Email: stevefrey@kennedyjenks.com

Robinson, Donna

From: Jackson, Bill -FS <bjackson02@fs.fed.us>
Sent: Friday, October 25, 2013 1:18 PM
To: Jacqueline_evans@deq.state.ms.us
Cc: Anderson, Bret A -FS; Steve Frey (SteveFrey@KennedyJenks.com); Krivo, Stan; Thurmond, Dagmar -FS; Bond, Meredith <meredith_bond@fws.gov> (meredith_bond@fws.gov); Pitrolo, Melanie -FS
Subject: Initial response to the proposed MS Silicon, LCC permit

Dear Jackie,
We are making good progress on completing our review of the Class I atmospheric dispersion modeling analysis for the proposed Mississippi Silicon, LCC facility. To date, we have focused on the 2001 modeling results and have confirmed the input values for CALPUFF, POSTUTIL, and CALPOST do match the values in our Reviewer's Guide document. Our final step is to make sure the emission rates used in CALPUFF match those reported for the simultaneous operation of two Arc Furnaces.
We have also taken a look at the draft permit prepared by your agency and I am very concerned with item III.55 (page 18, and see at the bottom of this email) and recommend that it be removed. As it is currently written, this permit condition could increase daily emissions without doing an adequate AQRV analysis for Sipsey Wilderness. It is my opinion that if this permit condition were implemented then it would circumvent the PSD process regarding protection for the Air Quality Related Values at Sipsey Wilderness and may result in an adverse impact if more than two of the Submerged Arc Furnaces are operated simultaneously.
If the permit condition (III.55) is not removed then I believe the current CALPUFF analysis should be modified with emissions occurring simultaneously from all four of the submerged Arc Furnaces. I look forward to this issue being resolved before we begin the technical briefing for the Federal Land Manager for Sipsey Wilderness. Please let me know if you would like to have a conference call with Bret Anderson and myself early next week to discuss this matter further.
Best regards,
Bill Jackson
Air Resource Specialist
USDA Forest Service
160A Zillicoa Street
Asheville, NC 28801
Email: bjackson02@fs.fed.us
Office phone #: 828-257-4815
III.55: For Emission Pint AA-201 (Submerged Arc Furnaces), the permittee can formally request removal of the restriction on the number of Submerged Arc Furnaces that can operate at any given time. To request elimination of this restriction, the permittee must submit a demonstration to the MDEQ that operation of the 4 Submerged Arc Furnaces would not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS) following EPA's Appendix W requirements for conducting an air quality impact evaluation. Operation of 4 Submerged Arc Furnaces at any given time can only occur after formal approval from the MDEQ. Any request for elimination of this restriction must be provided by the permittee in writing to the MDEQ no later than 180 days prior to operation of the 4 Submerged Arc Furnaces simultaneously. (Ref.: PSD Construction Permit Issued Issuance Date)

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law and subject the violator to civil or criminal penalties. If you believe you have received this message in error, please notify the sender and delete the email immediately.

Release

Summary of Steps Used i
Quality Impact Evalu
(October 2013)

MISSISSIPPI
SILICON

Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
50 Industrial Drive
Burnsville, MS 38847

Date: October 22, 2013

- Step 1 – Evaluated the proposed plant worst case operating conditions including Phases I and II

- Step 2 – Proposed plant will have significant impacts for PM_{10}, $PM_{2.5}$, SO_2 and NO_2. CO has insignificant impact

    - Distance of SIL Area (Table 4 – Addendum #1)

        - PM_{10} – 4 km
        - $PM_{2.5}$ – 7 km
        - NO_2/SO_2 – 50 km

- Step 3 – Proposed plant sets the minor source PSD Class II increment baseline date (Table 5d - Addendum #1). Predicted concentrations below Class II increments

- Step 4 – MDEQ identified one existing source as an SO_2 increment consuming source. This source is Kingsford Manufacturing Company located in Alcorn County, MS. Reran initial receptor grid on October 21, 2013 with MS Silicon sources and Kingsford – No changes in predicted concentrations.

- Step 5 – Modeled proposed plant and existing significant PM_{10} and $PM_{2.5}$ sources on respective SIL areas (Table 10 – Addendum #1). Inclusion of background concentration shows predicted concentrations below NAAQS.

- Step 6 – Modeled proposed plant and existing significant NO_x and SO_2 emission sources (Table 10 – Addendum #1). Predicted concentrations exceeded NO_2 and SO_2 1-hour NAAQS by a factor of 5.

- Step 7 – Performed source culpability analysis to determine contribution from individual existing sources (Table 10a – Addendum #1). Two major contributors identified – Columbia Gas Transmissions and TVA Colbert. ***Modeling run currently running to confirm that no other existing emission source would result in impacts above the corresponding NAAQS. Each individual source is being evaluated to determine its impact on the receptor grid.***

- Step 8 – ***Modeling run currently running to determine predicted concentrations for 1-hour NO_2 and SO_2 excluding the two major contributing sources***. Predicted concentrations resulting from these two sources show numerous receptors exceeding the NO_2 and SO_2 1-hour NAAQS

- Step 9 – Determined the maximum impact of the proposed plant on critical receptors at the two major contributing sources. The maximum point of impact would be receptors located along a line between the MS Silicon plant (center point)

and each of the two contributing sources. Since this is a 1-hour averaging period, the maximum impact downwind of each source was evaluated. The analysis performed was used to demonstrate that the MS Silicon plant does not have a significant 1-hour impact at the maximum point of interaction

- Step 10 – Five (5) receptors spaced at 250 meters were located downwind of the two existing sources along the interaction line. Those receptors were modeled to show the maximum predicted concentrations from the proposed plant (Table 11 – Addendum #1). Predicted concentrations were shown to be below the corresponding SILs. To achieve these predicted concentrations, MS Silicon proposed to limit operation of the 4 SAFs to no more than 2 SAFs operating at any given time. This will be included as an enforceable permit condition by the MDEQ.

Only

Public Notice
Mississippi Environmental Quality Permit Board
P. O. Box 2261
Jackson, MS 39225
Telephone No. (601) 961-5171

Public Notice Start Date: October 24, 2013
Deadline For Comment: November 22, 2013

MDEQ Contact: Bonnie Morgan

Mississippi Silicon, LLC, located East of County Roads 210 and 365 in Burnsville, Mississippi, (740) 525-9396 (Ohio) has applied to the Mississippi Department of Environmental Quality for Issuance of a Prevention of Significant Deterioration Construction Permit: Air Ref. No. 2640-00060. The PSD Construction Permit shall satisfy the requirement for a permit to operate until the date the application for issuance of the Title V Permit to Operate is due.

The applicant's operations fall within SIC Code 3339 for the manufacturing of Primary Nonferrous Metals for the manufacturing of Silicon Metal through the mixing of quartz, coal, and wood in semi-enclosed submerged arc furnaces to produce 98% pure silicon. The Silicon is further processed in either form of Silicon Ingot or Silicon Flake. As a result of these operations, the proposed facility is subject to Compliance Assurance Monitoring (CAM), New Source Performance Standards (NSPS) Subpart Z (Ferroalloy Production), NSPS Subpart IIII (Stationary Compression Ignition Internal Combustion Engines), National Emission Standards for Hazardous Air Pollutants (NESHAP) for Area Sources Subpart YYYYYY (Ferroalloy MACT), NESHAP Subpart ZZZZ (Reciprocating Internal Combustion Engine MACT) and PSD for Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Particulate Matter (PM), Particulate Matter 10 (PM_{10}), Particulate Matter 2.5 ($PM_{2.5}$), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOCs), and Green House Gases (regulated as Carbon Dioxide equivalent (CO_2e)). PSD regulations, which set certain requirements on the permissible incremental impact on air quality and the degree of control of air contaminants, has been reviewed for compliance with those regulations. The project will be located in a PSD Class II area and the following consumption of air quality increments is predicted to occur:

Particulate Matter Less than 2.5 microns

Annual	1.94 micrograms per cubic meter or
	48.5% of the 4 micrograms per cubic meter increment.
24-Hour	7.82 micrograms per cubic meter or
	86.8% of the 9 micrograms per cubic meter increment.

Particulate Matter Less than 10 microns

Annual	3.59 micrograms per cubic meter or
	21.11 % of the 17 micrograms per cubic meter increment.
24-Hour	16.68 micrograms per cubic meter or
	55.6% of the 30 micrograms per cubic meter increment.

Sulfur Dioxide

Annual	4.79 micrograms p er cubic meter or
	23.95% of the 20 micrograms per cubic meter increment.
24-hour	26.02 micrograms per cubic meter or
	28.59% of the 91 micrograms per cubic meter increment.
3-hour	68.89 micrograms per cubic meter or
	13.45% of the 512 micrograms per cubic increment.

Nitrogen Dioxide

Annual	6.19 micrograms per cubic meter or
	24.76% of the 25 micrograms per cubic meter increment.

The staff of the Permit Board has developed the proposed draft permit based on information submitted to the Permit Board by the applicant, appropriate State and Federal agencies and other interested parties. A Preliminary Determination, also referred to as a Statement of Basis, has been prepared that contains a discussion of decision-making that went into the development of the permit and to provide the permitting authority, the public, and other government bodies a record of the technical issues surrounding issuance of the permit. The Preliminary Determination includes the discussion of the Best Available Control Technology (BACT) Analysis for all emission points/sources emitting pollutants subject to PSD with the construction application. As a result of this analysis and the proposed limitations by the facility which was based upon this analysis, the staff of the department believes that with these constraints and limitations proposed by the facility and included in the draft permit, this operation will meet all State and Federal air pollution control laws and standards.

The staff of the Permit Board is soliciting all relative information pertaining to the proposed activity, including public comment, to ensure that the final staff recommendation on the draft permit complies with all State and Federal regulations. Public review and comment on the draft permit and supporting documentation is an important element in the staff evaluation and resulting recommendation to the Permit Board. The draft permit conditions have been developed to ensure compliance with all State and Federal regulations but are subject to change based on information received as a result of public participation.

Persons wishing to comment upon or object to the proposed determinations are invited to submit comments in writing to Bonnie Morgan at the Permit Board's address shown above, no later than November 22, 2013. All comments received by this date will be considered in the formulation of final determinations regarding the application. A public hearing will be held if the Permit Board finds a significant degree of public interest in the proposed permit. The Permit Board is limited in the scope of its analysis to environmental impact. Any comments relative to zoning or economic and social impacts are within the jurisdiction of local zoning and planning authorities and should be addressed to them.

Additional details about the application, including a copy of the draft permit, are available by writing or calling Freedom of Information Act Contact at the above Permit Board address and telephone number. Additionally, as a courtesy, for those with Internet access, a copy of the proposed draft permit may be found on the Mississippi Department of Environmental Quality's website at: http://opc.deq.state.ms.us/publicnotice.aspx . This information is also available for review at the following locations during normal business hours:

Mississippi Department of Environmental Quality
Office of Pollution Control
515 E. Amite St
Jackson, MS 39201

Burnsville Public Library
PO Box 188
Burnsville, MS 38833

Please bring the foregoing to the attention of persons whom you know will be interested.

Robinson, Donna

Release
- MDEQ
- redact login & password?

From: Bonnie_Morgan@deq.state.ms.us
Sent: Thursday, October 24, 2013 2:29 PM
To: Krivo, Stan
Subject: RE: Access to MS Silicon
Attachments: enSearch Online Public Notice152.rtf; 2640-00060 . . . . . .

I'm sorry your having trouble Stan. I'm going to try and break these apart. They're large documents and having a hard time going through so bear with me. I'm also copying the rest of the gang to make sure they get them as well. So please be patient with me. If you need anything further, please don't hesitate. Thank you for letting me know and I know we'll all be talking soon. Thanks!
(See attached file: enSearch Online Public Notice152.rtf)(See attached file: 2640-00060 Proposed Draft Permit.doc) _____

Bonnie Grey Morgan
Metals and Metal Manufacturing Branch
Environmental Permits Division
Office of Pollution Control
Mississippi Department of Environmental Quality
(601) 961-5784
Physical Address: 515 Amite Street, Jackson, MS 39201 Mailing Address: P.O. Box 2261, Jackson, MS 39225

From:"Krivo, Stan" <Krivo.Stanley@epa.gov> To:"Bonnie_Morgan@deq.state.ms.us" <Bonnie_Morgan@deq.state.ms.us>,
Date:10/24/2013 01:13 PM
Subject:RE: Access to MS Silicon

Bonnie,

I cannot find the preliminary determination document on the referenced website.
Please let me know how I can access this document.
Thanks...sjk

-----Original Message-----
From: Bonnie_Morgan@deq.state.ms.us [mailto:Bonnie_Morgan@deq.state.ms.us]
Sent: Thursday, October 24, 2013 12:06 PM
To: Jim_Tillman@deq.state.ms.us
Cc: Krivo, Stan
Subject: Re: Access to MS Silicon

Also Jim,
Can't Stan along with the public gain access to the permits as well as the preliminary determination from our website now?
Thanks to the both of you!

_____
Bonnie Grey Morgan
Metals and Metal Manufacturing Branch

Environmental Permits Division
Office of Pollution Control
Mississippi Department of Environmental Quality
(601) 961-5784
Physical Address: 515 Amite Street, Jackson, MS 39201 Mailing Address: P.O. Box 2261, Jackson, MS 39225

From:Jim Tillman/EPD/OPC/DEQ
To:Bonnie Morgan/EPD/OPC/DEQ@DEQ,
Cc:Krivo.Stanley@epa.gov
Date:10/24/2013 10:32 AM
Subject:Re: Access to MS Silicon

Stan..

Did you try
login: enreview
password: msdeq$

I was able to access and see the listing and the App. Summary document.

(See attached file: letter948214.rtf)

From:Bonnie Morgan/EPD/OPC/DEQ
To:Jim Tillman/EPD/OPC/DEQ@DEQ,
Cc:Krivo.Stanley@epa.gov
Date:10/24/2013 09:10 AM
Subject:Re: Access to MS Silicon

Jim, can you help Stan with this? Thanks!

Bonnie Grey Morgan
Metals and Metal Manufacturing Branch
Environmental Permits Division
Office of Pollution Control
Mississippi Department of Environmental Quality
(601) 961-5784
Physical Address: 515 Amite Street, Jackson, MS 39201 Mailing Address: P.O. Box 2261, Jackson, MS 39225

From:"Krivo, Stan" <Krivo.Stanley@epa.gov> To:"Bonnie_Grey@deq.state.ms.us" <Bonnie_Grey@deq.state.ms.us>,
Date:10/24/2013 09:03 AM
Subject:Access to MS Silicon

Bonnie,

I can't access the MDEQ PSD enReview information. I have tried the name and password provided by Jackie Evan but still have problems.
Please let me know what I should do to obtain access to this information.
Thanks...sjk

Stanley J. Krivo
U.S. Environmental Protection Agency
Atlanta Federal Center, 61 Forsyth Street, SW Atlanta, GA 30303
404/562-9123 (Phone) 404/562-9091 (Fax)

STATE OF MISSISSIPPI
AIR POLLUTION CONTROL
PERMIT

AND PREVENTION OF SIGNIFICANT DETERIORATION AUTHORITY TO CONSTRUCT AIR EMISSIONS EQUIPMENT

THIS CERTIFIES THAT

Mississippi Silicon LLC
Burnsville, Mississippi
Tishomingo County

has been granted permission to construct air emissions equipment to comply with emission limitations, monitoring requirements and other conditions set forth herein. This permit is issued in accordance with the provisions of the Mississippi Air and Water Pollution Control Law (Section 49-17-1 et. seq., Mississippi Code of 1972), and the regulations and standards adopted and promulgated thereunder and under authority granted by the Environmental Protection Agency under 40 CFR 52.01 and 52.21.

MISSISSIPPI ENVIRONMENTAL QUALITY PERMIT BOARD

_____

AUTHORIZED SIGNATURE
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

Issued: Issuance Date **Permit No.: 2640-00060**

PART I
GENERAL CONDITIONS

I.1. Any activities not identified in the application are not authorized by this permit.

I.2. All air pollution control facilities shall be designed and constructed such as to allow proper operation and maintenance of the facilities.

I.3. The necessary facilities shall be constructed so that solids removed in the course of control of air emissions may be disposed of in a manner such as to prevent the solids from becoming windborne and to prevent the materials from entering State waters without the proper environmental permits.

I.4. The air pollution control facilities shall be constructed such that diversion from or bypass of collection and control facilities is not needed except as provided for in Regulation APC-S-1, "Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants", Section 10.

I.5. The construction of facilities shall be performed in such a manner as to reduce both point source and fugitive dust emissions to a minimum.

I.6. The permittee shall allow the Mississippi Department of Environmental Quality Office of Pollution Control and the Mississippi Environmental Quality Permit Board and/or their representatives upon presentation of credentials:

a. To enter upon the permittee's premises where an air emission source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any air emissions.

I.7. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to:

a. Violation of any terms or conditions of this permit.

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts, or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of authorized air emissions.

I.8. Except for data determined to be confidential under the Mississippi Air & Water Pollution Control Law, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Mississippi Department of Environmental Quality Office of Pollution Control.

I.9. The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

I.10. Nothing herein contained shall be construed as releasing the permittee from any liability for damage to persons or property by reason of the installation, maintenance, or operation of the air cleaning facility, or from compliance with the applicable statutes of the State, or with local laws, regulations, or ordinances.

I.11. This permit may only be transferred upon approval of the Mississippi Environmental Quality Permit Board.

I.12. This permit is for air pollution control purposes only.

I.13. Approval to construct will expire should construction not begin within eighteen (18) months of the issuance of this permit, or should construction be suspended for eighteen (18) months.

I.14. The permittee shall notify the MDEQ in writing when construction of the facility begins within fifteen (15) days of beginning actual construction.

I.15 Upon the completion of construction or installation of an affected source, the permittee shall notify the Permit Board within thirty (30) days that construction or installation was performed in accordance with the approved plans and specifications on file with the permit board. Certification of Construction for the purposes of this permit is defined as completion of the commissioning and testing, of all of the major production lines, which allows the beginning of operations as an integrated facility.

I.16 The Permit to Construct shall be deemed to satisfy the requirement for a permit to operate until the date the application for issuance of the Title V Permit to Operate is due. The permittee shall submit an application for a Title V Permit to Operate no later than twelve (12) months after beginning operation. Beginning operation will be assumed to occur upon certification of construction, unless the permittee specifies differently in writing.

PART II
EMISSION POINT DESCRIPTION

The permittee is authorized to construct air emissions equipment for the emission of air contaminants from the Silicon Manufacturing Plant:

Emission Point	Description
AA-000	**Silicon Manufacturing Plant**
AA-100	**Raw Material Receiving, Handling and Storage Operations**
AA-101	Material Handling and Transfer to and from Coal Storage Pile
AA-101a	Conveyance of Coal to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-102	Material Handling and Transfer to and from Wood Storage Pile
AA-102a	Conveyance of Wood to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-102b	Wood Chipper
AA-103	Material Handling and Transfer to and from Quartz Storage Pile
AA-103a	Conveyance of Quartz to Charging Storage Silo equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG5)
AA-104	Material Handling and Transfer to and from Limestone Storage Pile
AA-105	Storage Piles Processing (i.e., Bulldozing)
AA-106	Wind Erosion on Coal, Wood and Quartz Storage Piles
AA-200	**Silicon Manufacturing Plant**

Emission Point	Description
AA-201	Four (4) Submerged Arc Furnaces equipped with individual negative pressure Baghouses (BG1, BG2, BG3, and BG4) for controlling emissions from the maximum production capacity of 2.75 tons/hour per furnace and 11.0 tons/hour utilizing all four furnaces and 21,024 tons/year per furnace and 84,096 tons/year utilizing all four furnaces.
AA-201a	Casting Frames
AA-202	Four (4) 10.0 MMBTU/Hr Natural Gas-Fired Ladle Preheaters (2 ton ladle capacity)
AA-300	**Product Refinement and Handling**
AA-301	Silicon Grinding and Milling Operations equipped with a baghouse or combination of baghouses with 120,000 acfm for controlling emissions (BG6)
AA-400	**Other Plantwide Operations and Activities**
AA-401	One (1) 500 gallon Diesel Storage Tank
AA-402	Plantwide Fugitive Emissions from Roadways
AA-402a	Plantwide Fugitive Emissions from Transport of Raw Materials (Material Storage Piles to SAF Charging Building)
AA-403	Slag Handling and Storage
AA-404	Silica Fume Silos
AA-405	Facility Wide Miscellaneous Operations subject to APC-S-6 *(Insignificant Activities)*
AA-500	**Emergency Support Equipment**
AA-501	One (1) 670 HP Diesel-Fired Emergency Generators

PART III
EMISSION POINT SPECIFIC LIMITATIONS AND STANDARDS

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-000 *(Entire Facility)*	PSD Construction Permit Issued Issuance Date	III.1	Silicon Production	84,096 tpy
		III.2	Natural Gas Combustion	350,000 MMBtu/yr
		III.3	NOx	1,906.2 tpy
		III.4	CO	1,444.3 tpy
		III.5	SO2	2,170.1 tpy
		III.6	VOC	93.5 tpy
		III.7	PM/PM10	81.8 tpy
		III.8	PM2.5	73.33 tpy
		III.9	HAP	9.90 tpy (Single)
				24.9 tpy (Combined)
AA-101 *(Coal Storage Pile Material Handling)*	PSD Construction Permit Issued Issuance Date	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier (where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.11	Material Throughput Rate	105,120 tpy
AA-101a (Coal Conveyance)	PSD Construction Permit Issued Issuance Date	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-102 *(Wood Storage Pile Material Handling)*	PSD Construction Permit Issued Issuance Date	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.13	Material Throughput Rate	212,763 tpy

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-102a (Wood Conveyance)	PSD Construction Permit Issued Issuance Date	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-102b *(Wood Chipper)*	PSD Construction Permit Issued Issuance Date	III.14	PM/PM10/ PM2.5	BACT: Operation with an enclosure that will minimize fugitive emissions and limited hours of operation
AA-103 *(Quartz Storage Pile Material Handling)*	PSD Construction Permit Issued Issuance Date	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.15	Material Throughput Rate	212,763 tpy
AA-103a (Quartz Conveyance)	PSD Construction Permit Issued Issuance Date	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-104 *(Limestone Storage Pile Material Handling)*	PSD Construction Permit Issued Issuance Date	III.10	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier(where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions
		III.16	Material Throughput Rate	183 tpy
AA-105 *(Storage Piles Processing)*	PSD Construction Permit Issued Issuance Date	III.17	PM/PM10/ PM2.5	BACT: Development of Dust Control Plan including measures to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required
AA-106 *(Storage Pile Wind Erosion)*	PSD Construction Permit Issued Issuance Date	III.18	PM/PM10/ PM2.5	BACT: Implementation of a Fugitive Dust Control Plan. Visible emissions shall be controlled using water, dust suppressants, or wind screens as needed.

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued Issuance Date	III.19	PM/PM10/ PM2.5	BACT: 0.005 gr/dscf and use of fabric filter control (i.e., baghouse)
	40 CFR 60.262(a)(1)	III.20	PM	0.99 lb/MW-hr (compliance with 40 CFR 60, Subpart Z)
	PSD Construction Permit Issued Issuance Date	III.21	GHG (as CO2e)	BACT: 95,467 tpy of CO2e per furnace and 381,866 tpy of CO2e f for all Furnaces combined; Use of Semi-Enclosed Furnace; and Good Operation and Maintenance
		III.22	NOx	BACT: 45.0 lbs/ton (averaged over a 3-hr period) of Silicon produced
		III.23	CO	BACT: 34.0 lbs/ton (averaged over a 3-hr period) of Silicon produced; Good Combustion and Operating Practices; Use of Semi-Enclosed Furnace
	40 CFR 60.263(a)	III.24		Less than 20 volume percent on a dry basis
	PSD Construction Permit Issued Issuance Date	III.25	SO2	BACT: 52.0 lbs/ton (averaged over a 3-hr period) of Silicon produced; and Utilization of Low Sulfur Content Material (where technically feasible)
		III.26	VOC	BACT: 2.4 lbs/ton (averaged over a 30-day period) of Silicon produced; and Good Operating Practices
	40 CFR 60.264(a)	III.27	Opacity	Continuous Opacity Monitoring (COM) Installation and Operation
	40 CFR 60.264(b)	III.28		15% from control device (i.e., fabric filter)
	PSD Construction Permit issued Issuance Date	III.54	Operating Limit	Only Two out of the Four Furnaces may be operated at any given time.
		III.55		Requirements to Remove Operating Restrictions
AA-201a *(Casting Frames)*	PSD Construction Permit Issued Issuance Date	III.29	PM/PM10/ PM2.5	BACT: Best Management Practices to minimize the generation of fugitive particulate emissions
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued Issuance Date	III.30	NOx	BACT: 0.08 lbs/MMBTU; low NOx or equivalent burners/technology; combustion of clean fuel; and good combustion practices

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued Issuance Date	III.31	GHG	BACT: 117 lb/MMBTU of CO2
				BACT: 0.0022lb/MMBtu of Methane;
				BACT: 0.0002 lb/MMBtu of N2O
				BACT: Good Combustion Practices, Combustion of Natural Gas Only, Periodic Maintenance, and energy efficient burner design including Low NOx burners or equivalent
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued Issuance Date	III.32	PM/PM10/ PM2.5	BACT: 0.0076 lbs/MMBTU; Combustion of Natural Gas; and Good Combustion Practices
		III.33	CO	BACT: 0.0840 lbs/MMBTU; Combustion of Natural Gas; and Good Combustion Practices
		III.34	SO2	BACT: 0.0006 lbs/MMBtu; Combustion of Clean Fuel (i.e., Combustion of Natural Gas Only); and Good Combustion Practices
		III.35	VOC	BACT: 0.0055lb/MMBtu; Combustion of Natural Gas; and Good Operating Practices
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued Issuance Date	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM control
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued Issuance Date	III.17	PM/PM10/ PM2.5	BACT: Development of Dust Control Plan including measures to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required
AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued Issuance Date	III.12	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM/PM10/PM2.5 control
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued Issuance Date	III.36	PM/PM10/ PM2.5	BACT: 0.01 gr/dscf for PM10/PM2.5 and the use of Bin Vent Filter for PM Control
	40 CFR 60.262(b)	III.37	Opacity	Dust Handling Equipment Emissions shall not exceed 10%

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued Issuance Date	III.38	PM/PM10/ PM2.5	BACT: Good Combustion and Operating Practices and Compliance with NSPS IIII
			CO	
			VOC	
			NOx	BACT: Good Combustion and Operating Practices; Compliance with NSPS IIII; and Use of Ultra Low Sulfur Diesel (ULSD) fuel
			SO2	
	40 CFR 60.4200(a)(2)(i)	III39	NSPS Subpart IIII	Applicability
	40 CFR 60.4206	III.40		Lifetime Requirements
	40 CFR 60.4205(b)	III.41		Emission Standards
	40 CFR 60.4207(b)	III.42		Diesel Fuel Requirements
AA-000 *(Entire Facility)* **where applicable*	40 CFR 64.2(a)	III.43	CAM	Applicability
	40 CFR 60.260	III.44	NSPS Subpart Z	Applicability
	40 CFR 63.11524(a) and (b)(2)	III.45	MACT Subpart YYYYYY	Applicability
	40 CFR 63.11525(c)	III.46		Compliance Date (Upon Startup)
	40 CFR 63.11526	III.47		Emission Standards
	40 CFR 63.6585(a) and (c) via 63.6590(c)	III.48	MACT Subpart ZZZZ	Compliance via NSPS Subpart IIII
	PSD Construction Permit Issued Issuance Date	III.49	Opacity	No more than 20%

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Limit/Standard
AA-405 *(Insignificant Activities)* **where applicable*	APC-S-1, Section 3.4(a)(1)	III.50	PM/PM10	0.6 lbs/MMBTU or as otherwise limited by facility modification restrictions
	APC-S-1, Section 3.4(a)(2)	III.51		$E = 0.8808*I^{-0.1667}$ or as otherwise limited by facility modification restrictions.
	APC-S-1, Section 3.8(a)	III.52		0.2 grains/dscf of flue gas calculated to 12% CO_2 by volume
	APC-S-1, Section 4.1(a)	III.53	SO2	4.8 lbs/MMBTU per hour or as otherwise limited by facility modification restrictions

III.1 For Emission Point AA-000 (Entire Facility), the permittee shall limit the annual Silicon Production to no more than 84,096 tons per year (tpy) as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit Issued Issuance Date)

III.2 For Emission Point AA-000 (Entire Facility), the permittee shall limit Natural Gas Combustion to no more than 350,000 MMBtu per year (MMBTU/yr) as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.3 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Nitrogen Oxides (NOx) to no more than 1,906.2 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.4 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Carbon Monoxide (CO) to no more than 1,444.3 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.5 For Emission Point AA-000 (Entire Faciltiy), the permittee shall limit emissions of Sulfur Dioxide (SO2) to no more than 2,170.1 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.6 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Volatile Organic Compounds (VOCs) to no more than 93.5 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.7 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Particulate Matter/Particulate-10 (PM/PM-10) to no more than 81.8 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.8 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Particulate Matter-2.5 to no more than 73.33 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.9 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Hazardous Air Pollutants (HAPs) to no more than 9.90 tpy for any single HAP and 24.9 tpy for combined HAPs, as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.10 For Emission Points AA-101, AA-102, AA-103, and AA-104 (Coal, Wood, Quartz, and Limestone Storage Pile Material Handling Areas), the permittee shall implement as appropriate the following Best Management Practices for minimizes PM emissions (BACT for PM/PM10/PM2.5);

(a) Install a 3-sided windscreen barrier (where technically feasible);
(b) Reduce drop heights;
(c) Use chemical stabilizers;
(d) Use watering Techniques; and

(e) Develop and Implement a Fugitive Dust Control Plan

(Ref.: PSD Construction Plan Issued Issuance Date)

III.11 For Emission Point AA-101 (Coal Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 105,120 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.12 For Emission Point AA-101a, AA-102a, AA-103a, AA-301, and AA-403 (Coal, Wood, and Quartz Conveyance, Silicon Grinding and Milling, and Slag Handling and Storage) the permittee shall limit PM/PM10/PM2.5 emissions to no more than 0.003 grains per dry standard cubic foot (gr/dscf) and use a baghouse for PM/PM10/PM2.5 control (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit issued Issuance Date)

III.13 For Emission Point AA-102 (Wood Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 212,763 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.14 For Emission Point AA-102b (Wood Chipper), the permittee shall operate with an enclosure that will minimize fugitive emissions and limit the hours of operations to minimize PM/PM10/PM2.5 emissions (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit issued Issuance Date)

III.15 For Emission Point AA-103 (Quartz Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 212,763 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.16 For Emission Point AA-104 (Limestone Storage Pile Material Handling), the permittee shall limit the Material Throughput Rate to no more than 183 tpy as determined for each consecutive 12-month period. (Ref.: PSD Construction Permit issued Issuance Date)

III.17 For Emission Point AA-105 (Storage Piles Processing), the permittee shall implement a Dust Control Plan for minimizing PM/PM10/PM2.5 emissions (BACT for PM/PM10/PM2.5) which shall include as appropriate the following;

(a) Application of a wet suppressants;
(b) Watering Application;
(c) Spreed Reduction Implementation and Postings; and
(d) Vacuuming or Sweeping Methodologies

(Ref.: PSD Construction Plan Issued Issuance Date)

III.18 For Emission Point AA-106 (Storage Pile Wind Erosion), the permittee shall implement a Fugitive Dust Control Plan for minimizing PM/PM10/PM2.5 emissions (BACT for PM/PM10/PM2.5) which shall include as appropriate the following for controlling Visible Emissions:

(a) Water Application;
(b) Dust Suppressants; and
(c) Wind Screens

(Ref.: PSD Construction Plan Issued Issuance Date)

III.19 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit PM/PM10/PM2.5 emissions to no more than 0.005 gr/dscf and use a baghouse for PM control (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit issued Issuance Date)

III.20 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall limit PM emissions to no more than 0.99 lb/MW-hr for determining compliance with 40 CFR 60, Subpart Z. (Ref.: 40 CFR 60.262(a)(1))

III.21 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit emissions of Greenhouse Gases, expressed as Carbon Dioxide equivalent, to no more than 95,467 tpy per furnace and 381,866 tpy for all four furnaces combined, as determined for each consecutive 12-month period, and shall also use semi-enclosed furnaces and employ good operating and maintenance techniques (BACT for GHG (as CO2e)). (Ref.: PSD Construction Permit issued Issuance Date)

III.22 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit NOx emissions to no more than 45.0 lbs/ton as determined by a 3-hr rolling average period of Silicon produced (BACT for NOx). (Ref.: PSD Construction Permit issued Issuance Date)

III.23 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit CO emissions to no more than 34.0 lbs/ton, as determined by a 3-hr rolling average period of Silicon produced, and Utilize Good Combustion and Operation Practices and Semi-Enclosed Furnaces (BACT for CO). (Ref.: PSD Construction Permit issued Issuance Date)

III.24 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall limit CO emissions to no more than 20 volume percent on a dry basis for determining compliance with 40 CFR 60, Subpart Z. (Ref.: 40 CFR 60.263(a)). (Ref.: PSD Construction Permit issued Issuance Date)

III.25 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit SO2 emissions to no more than 52.0 lbs/ton, as determined by a 3-hr rolling average period of Silicon produced, and Utilize Low Sulfur Content Material where technically feasible (BACT for SO2). (Ref.: PSD Construction Permit issued Issuance Date)

III.26 For Emission Point AA-201 (Submerged Arc Furnace), the permittee shall limit VOC emissions to no more than 2.4 lbs/ton, as determined by a 30-day rolling average period of

Silicon produced, and Utilize Good Operating Practices (BACT for VOC). (Ref.: PSD Construction Permit issued Issuance Date)

III.27 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to the New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 - Subpart Z and shall install, calibrate, maintain, and operate a Continuous Opacity Monitoring (COM) Device as specified in 40 CFR 60.264(a). (Ref.: 40 CFR 60.264(a)).

III.28 For Emission Point AA-201 (Submerged Arc Furnace), the permittee is subject to New Source Performance Standards for Ferroalloy Production, specifically 40 CFR 60 – Subpart Z and report as excess emissions all six-minute periods in which the average opacity is 15 percent or greater leaving the control device (i.e., fabric filter) as specified in 40 CFR 60.264(b). (Ref.: 40 CFR 264(b))

III.29 For Emission Point AA-201a (Casting Frames), the permittee shall implement a system for ensuring that a system of Best Management Practices is implemented to minimize the generation of fugitive particulate emissions (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit issued Issuance Date)

III.30 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of NOx to no more than 0.08 lbs/MMBtu and utilize low NOx or equivalent burners/technology, combust clean fuel only and implement good combustion practices (BACT for NOx). (Ref.: PSD Construction Permit issued Issuance Date)

III.31 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of Greenhouse Gases (GHG) to the following BACT emissions limitations (BACT for GHG):

(a) Carbon Dioxide (CO2) emissions to no more than 117 lb/MMBtu
(b) Methane emissions to no more than 0.0022 lb/MMBtu
(c) Nitrous Oxide emissions to no more than 0.0002 lb/MMBtu
(d) Good Combustion Practices, Combustion of Natural Gas Only, Periodic Maintenance, and energy efficient burner design including Low NOx burners or equivalent.

(Ref.: PSD Construction Permit Issued Issuance Date)

III.32 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of PM/PM10/PM2.5 to no more than 0.0076 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for PM/PM10/PM2.5). (Ref.: PSD Construction Permit issued Issuance Date)

III.33 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of CO to no more than 0.0840 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for CO). (Ref.: PSD Construction Permit issued Issuance Date)

III.34 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of SO2 to no more than 0.0006 lbs/MMBtu, combust clean fuels only (i.e., natural gas only), and utilize good combustion practices (BACT for SO2). (Ref.: PSD Construction Permit issued Issuance Date)

III.35 For Emission Point AA-202 (Ladle Preheaters), the permittee shall limit emissions of VOC to no more than 0.0055 lbs/MMBtu, combust natural gas only, and utilize good combustion practices (BACT for VOC). (Ref.: PSD Construction Permit issued Issuance Date)

III.36 For Emission Point AA-404 (Silica Fume Silo), the permittee shall limit emissions of PM/PM10/PM2.5 to no more than 0.01 gr/dscf for PM/PM10/PM2.5 and the use of Bin Vent Filter (BACT for PM/PM10/PM2/5). (PSD Construction Permit issued Issuance Date)

III.37 For Emission Point AA-404 (Silica Fume Silo), the permittee is subject to 40 CFR 60.262(b) and shall limit emissions of Opacity from the Dust Handling Equipment to no more than 10% at any time. (Ref.: 40 CFR 60.262(b))

III.38 For Emission Point AA-501 (Emergency Generators), the permittee shall utilize Good Combustion and Operating Practices, utilize Ultra Low Sulfur Diesel (ULSD) Fuel, and comply with 40 CFR 60 – Subpart IIII for demonstrating compliance with PM/PM10/PM2.5, CO, VOC, NOx, and SO2. (BACT for PM/PM10/PM2.5, CO, and VOC is the Good Combustion and Operating Practices as well as complying with Subpart IIII and BACT for NOx and SO2 is Good Combustion and Operating Practices, compliance with Subpart IIII, and use of ULSD Fuel). (Ref.: PSD Construction Permit issued Issuance Date)

III.39 For Emission Point AA-501, the permittee is subject to 40 CFR 60 – New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines (Subpart IIII), specifically 40 CFR 60.4200(a)(2)(i), and shall comply with the applicable provisions. (Ref.: 40 CFR 60.4200(a)(2)(i))

III.40 For Emission Point AA-501, the permittee is subject to 40 CFR 60.4206 and shall comply with the applicable provisions and achieve the emission standards over the life of the engine. (Ref.: 40 CFR 60.4206)

III.41 For Emission Point AA-501, the permittee is subject to 40 CFR 4205(b) and shall comply with the applicable provision and shall achieve compliance with the emission standards. (Ref.: 40 CFR 4205(b))

III.42 For Emission Point AA-501, the permittee is subject to 40 CFR 4207(b) and shall comply with the Diesel Fuel Requirements of 40 CFR 50.510(b). (Ref.: 40 CFR 40.4207(b))

III.43 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 64.2(a) – Compliance Assurance Monitoring (CAM) Provisions where applicable and the applicable CAM Plan is not due until the Title V Permit to Operate is due, which is specified herein, as a requirement upon certification of construction (i.e., Condition I.16). (Ref.: 40 CFR 64.2(a))

III.44 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 60.260 – Subpart Z, Standards of Performance for Ferroalloy Production Facilities and shall comply with the applicable provisions. (Ref.: 40 CFR 60.260)

III.45 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11524(a) and (b)(2) – Subpart YYYYYY, National Emission Standards for Hazardous Air Pollutants for Area Sources: Ferroalloy Production Facilities and shall comply with the applicable provisions. (Ref.: 40 CFR 63.11524(a) and (b)(2))

III.46 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11525(c) and shall comply upon startup of the Ferroalloy Production Facility. (Ref.: 40 CFR 63.11525(c))

III.47 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63.11526 and shall comply with the following for demonstrating compliance with MACT YYYYYY:

(a) You shall not discharge to the atmosphere visible emissions (VE) from the control device that exceed 5 percent of accumulate occurrences in a 60-minute observation period.

(b) You shall not discharge to the atmosphere fugitive PM emissions from the furnace building containing the electrometallurgical operations that exhibit opacity greater than 20 percent (6-minute average), except for one 6-minute average per hour that does not exceed 60 percent.

(Ref.: 40 CFR 63.11526)

III.48 For Emission Point AA-000 (Entire Facility), the permittee is subject to 40 CFR 63 – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines and shall comply with this subpart by demonstrating compliance with the applicable provisions of 40 CFR 60 – Subpart IIII, as specified in 40 CFR 63.6585(a) and (c) via 63.6590(c). (Ref.: 40 CFR 63.6585(a) and (c) via 63.6590(c))

III.49 For Emission Point AA-000 (Entire Facility), the permittee shall limit emissions of Opacity to no more than 20% at any time. (Ref.: PSD Construction Permit issued Issuance Date)

III.50 For Emission Point AA-405 (Insignificant Activities), the maximum permissible emission of ash and/or particulate matter from each fossil fuel burning installations of less than 10 million BTU per hour heat input shall not exceed 0.6 pounds per million BTU per hour heat input. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.D(1)(a).)

III.51 For Emission Point AA-405 (Insignificant Activities), the maximum permissible emission of ash and/or particulate matter from fossil fuel burning installations equal to or greater than 10 million BTU per hour heat input but less than 10,000 million BTU per hour heat input shall not exceed an emission rate as determined by the relationship

$E = 0.8808*I^{-0.1667}$

where E is the emission rate in pounds per million BTU per hour heat input and I is the heat input in millions of BTU per hour. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.D(1)(b).)

III.52 For Emission Point AA-405 (Insignificant Activities), the permittee shall not cause the maximum discharge of particulate matter to exceed 0.2 grains per standard dry cubic foot of flue gas calculated to twelve percent (12%) carbon dioxide by volume for products of combustion. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.3.H(1).)

III.53 For Emission Point AA-405 (Insignificant Activities), the permittee shall not cause the maximum discharge of sulfur oxides from any fuel burning installations in which the fuel is burned primarily to produce heat or power by indirect heat transfer to exceed 4.8 pounds(measured as sulfur dioxide) per million BTU heat input. (Ref. 11 Miss. Admin Code Pt. 2, R. 1.4.A(1).)

III.54 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is only authorized to operate two (2) out of the four (4) Submerged Arc Furnaces at any given time and shall never operate all four combined Submerged Arc Furnaces at one time. (Ref.: PSD Construction issued Issuance Date)

III.55 For Emission Pint AA-201 (Submerged Arc Furnaces), the permittee can formally request removal of the restriction on the number of Submerged Arc Furnaces that can operate at any given time. To request elimination of this restriction, the permittee must submit a demonstration to the MDEQ that operation of the 4 Submerged Arc Furnaces would not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS) following EPA's Appendix W requirements for conducting an air quality impact evaluation. Operation of 4 Submerged Arc Furnaces at any given time can only occur after formal approval from the MDEQ. Any request for elimination of this restriction must be provided by the permittee in writing to the MDEQ no later than 180 days prior to operation of the 4 Submerged Arc Furnaces simultaneously. (Ref.: PSD Construction Permit Issued Issuance Date)

PART IV
EMISSION POINT SPECIFIC MONITORING REQUIREMENTS

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-000 *(Entire Facility)*	PSD Construction Permit Issued Issuance Date	IV.1	Silicon Production	Determine the Production for each consecutive 12-month period
		IV.2	Natural Gas Combustion	Determine the total Combustion Rate
		IV.3	Opacity	Determine using Method 22 and then Method 9 if emissions are present
		IV.4	Pretest Conference/ Protocol	30-days prior to performance testing if requested by MDEQ upon 60 day advanced of Stack Test Protocol
		IV.5	Control Equipment	Regular Maintenance shall be performed and kept in log form
		IV.6	NOx	Determine the Emission Rate for each consecutive 12 month period
		IV.7	CO	
		IV.8	SO2	
		IV.9	VOC	
		IV.10	PM/PM10	
		IV.11	PM2.5	
		IV.12	HAP	
AA-101 *(Coal Storage Pile Material Handling)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period
AA-101a (Coal Conveyance)	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-102 *(Wood Storage Pile Material Handling)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-102a (Wood Conveyance)	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-102b *(Wood Chipper)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-103 *(Quartz Storage Pile Material Handling)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period
AA-103a (Quartz Conveyance)	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Fugitive Dust Control Plan for demonstrating compliance with BACT
AA-104 *(Limestone Storage Pile Material Handling)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.14	Material Throughput Rate	Determine the Material Throughput Rate for each consecutive 12 month period
AA-105 *(Storage Piles Processing)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Fugitive Dust Control Plan for demonstrating compliance with BACT
AA-106 *(Storage Pile Wind Erosion)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
		IV.15	GHG (as CO2e)	Determine the CO2e Emission Rate for each consecutive 12 month period

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued Issuance Date	IV.16	NOx	Installation and Operation of CEMS
			CO	
			SO2	
			VOC	Initial Performance Test for Demonstrating Operational Ranges
			PM/PM10	
			PM2.5	
AA-201 *(Submerged Arc Furnaces)*	40 CFR 60.264	IV.17	NSPS Subpart Z	COMs Requirements
	40 CFR 60.265	IV.18		Monitoring of Operations
	40 CFR 60.266	IV.19		Compliance with Test Methods and Procedures
	40 CFR 63.11527(a)	IV.25	MACT Subpart YYYYYY	Monitoring
	40 CFR 63.11528	IV.26		Performance Testing and Compliance Requirements
AA-201a *(Casting Frames)*	PSD Construction Permit Issued Issuance Date	IV.20	PM/PM10/ PM2.5	Utilize Best Management Practices for demonstrating compliance with BACT
AA-202 *(Ladle Preheaters)*	PSD Construction Permit Issued Issuance Date	IV.21	NOx	Utilize Good Combustion Practices and Implement Maintenance Guidelines for demonstrating compliance with BACT
			GHG	
			PM/PM10/ PM2.5	
			CO	
			SO2	
			VOC	
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Monitoring Requirement
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued Issuance Date	IV.13	PM/PM10/ PM2.5	Implement and Develop a Dust Control Plan for demonstrating compliance with BACT
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued Issuance Date	IV.22	PM/PM10/ PM2.5	Implement Maintenance Guidelines for demonstrating compliance with BACT
			CO	
			VOC	
			NOx	
			SO2	
	40 CFR 60.4209	IV.23	NSPS Subpart IIII	Monitoring and Compliance Requirements
	40 CFR 60.4211(a), (c), (f), and (g)	IV.24		

IV.1 For Emission Point AA-000 (Entire Facility), the permittee shall determine the Silicon Produced for each consecutive 12-month period by obtaining data from purchasing, processing, and production, and any other data necessary to determine the facility wide production rate as determined for each consecutive 12-month period, for demonstrating compliance with Condition III.1 of the permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.2 For Emission Point AA-000 (Entire Facility), the permittee shall determine the Natural Gas Combustion Rate total for each consecutive 12-month period by utilizing energy records, reports, and any other data necessary to determine the facility wide Natural Gas Combustion Rate for determining compliance with Condition III.2 of the permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.3 For Emission Point AA-000 (Entire Facility), the permittee shall perform weekly Visual Emission Evaluations (VEEs/Observations) by Method 22, 40 CFR 60, Appendix A. Observations shall be conducted during daylight hours and while the equipment is in operation. If visible emissions are observed, excluding condensed water water vapor, the permittee shall:

(a) Within 24 hours, take corrective action that eliminates the visible emissions or verify that the unit causing the emission and any associated air pollution control equipment are operating normally in accordance with desiggn and standards procedures, and under the same conditions in which compliance was achieved in the past, and

(b) If visible emissions are not eliminated, have a certified visual emissions observer determine compliance with the opacity standard using EPA Reference Method 9 within three business days, and

(c) Report the visible emissions as a potential deviation (or as a violation if demonstrated by EPA Reference Method 9) according to the reporting requirements of this permit.

(Ref.: PSD Construction Permit issued Issuance Date)

IV.4 For Emission Point AA-000 (Entire Facility), the permittee shall submit a Performance Test Protocol 60 days prior to any Performance Test. Upon receipt of the Performance Test Protocol, the MDEQ may request a Pretest Conference to discuss the Performance Testing at least 30 days in advance of the Performance Test to discuss the Peformance Test or Performance Test Protocol. (Ref.: PSD Construction Permit issued Issuance Date)

IV.5 For Emission Point AA-000 (Entire Facility), the permittee shall perform regular maintenance on the control equipment according to the manufacturer design and recommendations. This maintenance shall be kept in log form and made available to MDEQ during inspections. (Ref.: PSD Construction Permit issued Issuance Date)

IV.6 For Emission Point AA-000 (Entire Facility), the permittee shall determine the NOx emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.3 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.7 For Emission Point AA-000 (Entire Facility), the permittee shall determine the CO emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.4 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.8 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the SO2 emission rate as determined for each consecutive 12-month period by utilizing data obtained from CEM, Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.5 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.9 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the VOC emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.6 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.10 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the PM/PM10 emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.7 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.11 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the PM2.5 emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.8 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.12 For Emission Point AA-000 (Entire Facility), the permittee shall the permittee shall determine the HAP (Individual and Combined) emission rates as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III.9 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.13 For Emission Points AA-101 (Coal Storage Pile Material Handling), AA-101a (Coal Conveyance), AA-102 (Wood Storage Pile Material Handling), AA-102a (Wood Conveyance), AA-102b (Wood Chipper), AA-103 (Quartz Storage Pile Material Handling),

AA-103a (Quartz Conveyance), AA-104 (Limestone Storage Pile Material Handling), AA-105 (Storage Piles Processing), AA-106 (Storage Pile Wind Erosion), AA-301 (Silicon Grinding and Milling), AA-402 and AA-402a (Unpaved and Paved Roads and Plantwide Transport Fugitive Emissions), the permittee shall develop and implement a Dust Control Plan for demonstrating compliance with the individual BACT Limits for PM/PM10/PM2.5, specifically Conditions III. III.10, III.12, III.14, III.17, and III.18, of the federally enforceable permit herein. For each emission point that operates a baghouse, the permittee shall install, maintain, and operate a continuous pressure drop monitor to monitor and record the differential pressure at least every 15 minutes. For each baghouse, the permittee shall establish a pressure drop range based on stack test data, vendor information, operational history, and/or visual inspections that indicates proper operation of the baghouse. These pressure drop ranges shall be maintained at the facility and be made available upon request from MDEQ personnel. Should a pressure drop reading fall outside the established range, the permittee shall immediately inspect the baghouse to determine the cause of the excursion and return the baghouse to normal operating conditions. The emission point ID, date, time, length of the excursion, and reason for an excursion from an established pressure drop range shall be recorded and any corrective measures taken to restore the baghouse to normal operating conditions shall be noted. (Ref.: PSD Construction Permit issued Issuance Date)

IV.14 For Emission Points AA-101 (Coal Storage Pile Material Handling), AA-102 (Wood Storage Pile Material Handling), AA-103 (Quartz Storage Pile Material Handling), and AA-104 (Limestone Storage Pile Material Handling), the permittee shall determine the Material Throughput Rate as determined for each consecutive 12-month period by utilizing data obtained from Purchasing Records, Production Records, and any other data necessary to demonstrate compliance with Condition III.11, III.13, III.15, and III.16, of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.15 For Emission Point AA-201 (Submerged Arc Furnaces), the permitee shall determine the CO2e emission rate as determined for each consecutive 12-month period by utilizing data obtained from Stack/Performance Testing, Natural Gas Usage Records, and any other data necessary to demonstrate compliance with Condition III. 21 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.16 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee shall install and operate a Continuous Emission Monitoring (CEM) System on the furnace baghouses for monitoring NOx, CO, and SO2 immediately upon operation of the furnaces and not beginning operation as defined by Condition I.15 of the federally enforceable permit herein (i.e, for the purpose of this permit and this condition specifically, the furnace baghouses will be treated as stand-alone units so that the CEMS will be installed sooner rather than later with regard to monitoring and compliance). The CEMS shall meet the applicable performance specification required by 40 PART 60, Appendix B, the applicable quality assurance procedures required by 40 CFR Part 60, Appendix F, and the requirements of 40 CFR 60.13. In lieu of the requirements of 40 CFR Part 60, Appendix F, 5.1.1, 5.1.3, and 5.1.4, the permittee may conduct either a Relative Accuracy Audit (RAA) or a Relative Accuracy Test Audit (RATA) on each CEMs at least once every three (3) years. The permittee shall conduct Cylinder Gas Audits (CGA) each calendar quarter during which a

RAA or a RATA is not performed. A CEMS is not required for PM, PM10, PM2.5 and VOC, but rather the permittee is required to perform an initial stack test within 180 days of reaching maximum production (not to exceed three years from start-up of Phase 1 of the facility) and develop operational ranges for demonstrating compliance with the PM, PM10, PM2.5 and VOC BACT limits. The permittee shall utilize Method 5 for PM/PM10, Method 201A for PM2.5, and Method 25A for VOC. The permittee shall repeat the performance if the facility's operations change such that the operational ranges would no longer be valid for determining compliance with the PM, PM10, PM2.5 or VOC BACT limits. The permittee may be required to repeat the Operation Range Performance Test at the MDEQ's discretion and request at any time during the Operating Permit (Title V) Term if the MDEQ determines necessary. During the performance test, the permittee shall monitor the following:

(a) Charge Weights and Materials, Tap Weights, and Materials;
(b) Heat Times, including Start and Stop Times, and a log of Process Operations, Including periods of no Operations during testing;
(c) Control Device Operation Log; and
(d) Continuous Monitor or Reference Method 9 data which is required to be performed and documented during said Performance Test.

In the event that the CEMS fails* so that the permittee cannot collect emissions data for NOx, CO, and SO2, the permittee will performance test for NOx, CO, and SO2 at a frequency of no less than monthly until such time that the CEMS system is performing to the manufacturer design and specification as required and specified in the above condition.
*Failure of the CEMS is to be determined by the staff of the MDEQ so that the permittee must expediently and readily develop a means of correcting the systems for collecting and measuring emissions in a timely manner.

(Ref.: PSD Construction Permit issued Issuance Date)

IV.17 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.264 and shall comply with the following emissions monitoring requirements for demonstrating compliance:

(a) The permittee is subject to the provisions of this subpart shall install, calibrate, maintain and operate a continuous monitoring system for measurement of the opacity of emissions discharged into the atmosphere from the control device(s).

(b) For the purpose of reports required under 40 CFR 60.7(c), the permittee shall report as excess emissions all six-minute periods in which the average opacity is 15 percent or greater.

(c) The permittee subject to the provisions of this subpart shall submit a written report of any product change to the DEQ. Reports of product changes must be postmarked not later than 30 days after implementation of the product change.

(Ref.: 40 CFR 60.264)

IV.18 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.265 and shall monitor the following operations for demonstrating compliance:

(a) The permittee of any electric submerged arc furnace subject to the provisions of this subpart shall maintain daily records of the following information:

(1) Product being produced.
(2) Description of constituents of furnace charge, including the quantity, by weight.
(3) Time and duration of each tapping period and the identification of material tapped (slag or product.)
(4) All furnace power input data obtained under paragraph (b) of this section.
(5) All flow rate data obtained under paragraph (c) of this section or all fan motor power consumption and pressure drop data obtained under paragraph (e) of this section.

(b) The permittee subject to the provisions of this subpart shall install, calibrate, maintain, and operate a device to measure and continuously record the furnace power input. The furnace power input may be measured at the output or input side of the transformer. The device must have an accuracy of ±5 percent over its operating range.

(c) The permittee subject to the provisions of this subpart shall install, calibrate, and maintain a monitoring device that continuously measures and records the volumetric flow rate through each separately ducted hood of the capture system, except as provided under paragraph (e) of this section. The permittee of an electric submerged arc furnace that is equipped with a water cooled cover which is designed to contain and prevent escape of the generated gas and particulate matter shall monitor only the volumetric flow rate through the capture system for control of emissions from the tapping station. The permittee may install the monitoring device(s) in any appropriate location in the exhaust duct such that reproducible flow rate monitoring will result. The flow rate monitoring device must have an accuracy of ±10 percent over its normal operating range and must be calibrated according to the manufacturer's instructions. The DEQ may require the permittee to demonstrate the accuracy of the monitoring device relative to Methods 1 and 2 of appendix A to this part.

(d) When performance tests are conducted under the provisions of 40 CFR 60.8 of this part to demonstrate compliance with the standards under 40 CFR 60.262(a) (4) and (5), the volumetric flow rate through each separately

ducted hood of the capture system must be determined using the monitoring device required under paragraph (c) of this section. The volumetric flow rates must be determined for furnace power input levels at 50 and 100 percent of the nominal rated capacity of the electric submerged arc furnace. At all times the electric submerged arc furnace is operated, the permittee shall maintain the volumetric flow rate at or above the appropriate levels for that furnace power input level determined during the most recent performance test. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator shall maintain the exhaust flow rates through the capture system over the tapping station at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the DEQ to be unacceptable operation and maintenance of the affected facility. The owner or operator may request that these flow rates be reestablished by conducting new performance tests under 40 CFR 60.8 of this part.

(e) The permittee may as an alternative to paragraph (c) of this section determine the volumetric flow rate through each fan of the capture system from the fan power consumption, pressure drop across the fan and the fan performance curve. Only data specific to the operation of the affected electric submerged arc furnace are acceptable for demonstration of compliance with the requirements of this paragraph. The permittee shall maintain on file a permanent record of the fan performance curve (prepared for a specific temperature) and shall:

(1) Install, calibrate, maintain, and operate a device to continuously measure and record the power consumption of the fan motor (measured in kilowatts), and

(2) Install, calibrate, maintain, and operate a device to continuously measure and record the pressure drop across the fan. The fan power consumption and pressure drop measurements must be synchronized to allow real time comparisions of the data. The monitoring devices must have an accuracy of ±5 percent over their normal operating ranges.

(f) The volumetric flow rate through each fan of the capture system must be determined from the fan power consumption, fan pressure drop, and fan performance curve specified under paragraph (e) of this section, during any performance test required under 40 CFR 60.8 to demonstrate compliance with the standards under 40 CFR 60.262(a)(4) and (5). The permittee shall determine the volumetric flow rate at a representative temperature for furnace power input levels of 50 and 100 percent of the nominal rated capacity of the electric submerged arc furnace. At all times the electric submerged arc furnace is operated, the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow

rate is at or above the levels established during the most recent performance test for that furnace power input level. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow rate is at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the DEQ to be unacceptable operation and maintenance of the affected facility. The permittee may request that these flow rates be reestablished by conducting new performance tests under 40 CFR 60.8. The DEQ may require the owner or operator to verify the fan performance curve by monitoring necessary fan operating parameters and determining the gas volume moved relative to Methods 1 and 2 of appendix A to this part.

(g) All monitoring devices required under paragraphs (c) and (e) of this section are to be checked for calibration annually in accordance with the procedures under 40 CFR 60.13(b).

(Ref.: 40 CFR 60.265)

IV.19 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject to 40 CFR 60.266 and shall comply with the following Test Methods and Procedures:

(a) During any performance test required in 40 CFR 60.8, the permittee shall not allow gaseous diluents to be added to the effluent gas stream after the fabric in an open pressurized fabric filter collector unless the total gas volume flow from the collector is accurately determined and considered in the determination of emissions.

(b) In conducting the performance tests required in 40 CFR 60.8, the permittee shall use as reference methods and procedures the test methods in appendix A of this part or other methods and procedures as specified in this section, except as provided in 40 CFR 60.8(b).

(c) The permittee shall determine compliance with the particulate matter standards in 40 CFR 60.262 as follows:

(1) The emission rate (E) of particulate matter shall be computed for each run using the following equation:

$$E = \left[\left(\sum_{i=1}^{N} C_{si} Q_{sdi} \right) \right] / (PK)$$

where:
E=emission rate of particulate matter, kg/MW-hr (1b/MW-hr).
n=total number of exhaust streams at which emissions are quantified.

c_{si} =concentration of particulate matter from exhaust stream "i", g/dscm (gr/dscf).
Q_{sdi} =volumetric flow rate of effluent gas from exhaust stream "i", dscm/hr (dscf/hr).
P=average furnace power input, MW.
K=conversion factor, 1000 g/kg (7000 gr/lb).

(2) Method 5 shall be used to determine the particulate matter concentration (c_{si}) and volumetric flow rate (Q_{sdi}) of the effluent gas, except that the heating systems specified in sections 2.1.2 and 2.1.6 are not to be used when the carbon monoxide content of the gas stream exceeds 10 percent by volume, dry basis. If a flare is used to comply with 40 CFR 60.263, the sampling site shall be upstream of the flare. The sampling time shall include an integral number of furnace cycles.

(i) When sampling emissions from open electric submerged arc furnaces with wet scrubber control devices, sealed electric submerged arc furnaces, or semienclosed electric arc furnaces, the sampling time and sample volume for each run shall be at least 60 minutes and 1.80 dscm (63.6 dscf).

(ii) When sampling emissions from other types of installations, the sampling time and sample volume for each run shall be at least 200 minutes and 5.66 dscm (200 dscf).

(3) The measurement device of 40 CFR 60.265(b) shall be used to determine the average furnace power input (P) during each run.

(4) Method 9 and the procedures in 40 CFR 60.11 shall be used to determine opacity.

(5) The emission rate correction factor, integrated sampling procedure of Method 3B shall be used to determine the CO concentration. The sample shall be taken simultaneously with each particulate matter sample.

(d) During the particulate matter run, the maximum open hood area (in hoods with segmented or otherwise moveable sides) under which the process is expected to be operated and remain in compliance with all standards shall be recorded. Any future operation of the hooding system with open areas in excess of the maximum is not permitted.

(e) To comply with 40 CFR 60.265 (d) or (f), the permittee shall use the monitoring devices in 40 CFR 60.265 (c) or (e) to make the required measurements as determined during the performance test.

(Ref.: 40 CFR 60.266)

IV.20 For Emission Point AA-201a (Casting Frames), the permittee shall utilize Best Management Practices for demonstrating compliance with the minimization of fugitive particulate emissions as required by Condition III.29 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.21 For Emission Point AA-202 (Ladle Preheaters), the permittee shall utilize Good Combustion Practices and Implement Maintenance Guidelines for demonstrating compliance with the NOx, GHG, PM/PM10/PM2.5, CO, SO2, and VOC BACT Limits as described in Conditions III.29, III.30, III.31, III.32, III.33, and III.34 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.22 For Emission Point AA-501 (Emergency Generators), the permittee shall implement Maintenance Guidelines for demonstrating compliance with PM/PM10/PM2.5, CO, VOC, NOx, and SO2 BACT limits as described in Condition III.37 of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

IV.23 For Emission Point AA-501 (Emergency Generators), if the permittee is subject to the monitoring provisions then the permittee shall also comply with the Monitoring and Compliance Requirements of 40 CFR 60.4209 and either comply by installing a non-resettable hour meter or a diesel particulate filter with a backpressure monitor. (Ref.: 40 CFR 60.4209)

IV.24 For Emission Point AA-501 (Emergency Generators), if the permittee is subject to the emissions standards of 40 CFR 60 – Subpart IIII, the permittee shall comply with the requirements of 40 CFR 60.4211(a), (c), (f), and (g)). (Ref.: 40 CFR 60.4211(a), (c), (f), and (g))

IV.25 For Emission Point AA-201 (Submerged Arc Furnacec), the permittee is subject to the monitoring provision of 40 CFR 63, Subpart YYYYYY and shall comply with the following:

(a) Each *EAF equipped with fabric filters* —

(1) *Visual monitoring.* The permittee shall perform visual monitoring of the monovent or fabric filter outlet stack(s) for any VE according to the schedule specified in paragraphs (a)(1)(i) and (a)(1)(ii) of this section.

(i) *Daily visual monitoring.* Perform visual determination of fugitive emissions once per day, on each day the process is in operation, during operation of the process.

(ii) *Weekly visual monitoring.* If no visible fugitive emissions are detected in consecutive daily visual monitoring performed in accordance with paragraph (a)(1)(i) of this section for 90 days

of operation of the process, the permittee may decrease the frequency of visual monitoring to once per calendar week of time the process is in operation, during operation of the process. If visible fugitive emissions are detected during these inspections, the permittee shall resume daily visual monitoring of that operation during each day that the process is in operation, in accordance with paragraph (a)(1)(i) of this section until the permittee satisfies the criteria of this section to resume conducting weekly visual monitoring.

(2) If the visual monitoring reveals the presence of any VE, the permittee shall conduct a Method 22 (appendix A-7 of 40 CFR part 60) test following the requirements of 40 CFR 63.11528(b)(1) within 24 hours of determining the presence of any VE.

(2) If you own or operate an existing affected source, the permittee shall install, operate, and maintain a bag leak detection system for each fabric filter as an alternative to the monitoring requirements in paragraph (a)(1) of this section. If the permittee owns or operates a new affected source, the permittee shall install, operate, and maintain a bag leak detection system for each fabric filter according to the requirements in paragraphs (a)(3)(i) through (a)(3)(vii) of this section. Such source is not subject to the requirements in paragraphs (a)(1) and (a)(2) of this section.

(i) The system must be certified by the manufacturer to be capable of detecting emissions of PM at concentrations of 10 milligrams per actual cubic meter (0.00044 grains per actual cubic foot) or less.

(ii) The bag leak detection system sensor shall provide output of relative PM loadings and the owner or operator shall continuously record the output from the bag leak detection system using a strip chart recorder, data logger, or other means.

(iii) The system must be equipped with an alarm that will sound when an increase in relative PM loadings is detected over the alarm set point established in the operation and maintenance plan, and the alarm must be located such that it can be heard, seen, or otherwise detected by the appropriate plant personnel.

(iv) The initial adjustment of the system must, at minimum, consist of establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device, and establishing the alarm set points. If the system is equipped with an alarm delay time feature, the permittee shall also must establish a maximum reasonable alarm delay time.

(v) Following the initial adjustment, do not adjust the sensitivity or range, averaging period, alarm set point, or alarm delay time, except that, once per quarter, the permittee may adjust the sensitivity of the bag leak detection system to account for seasonal effects including temperature and humidity.

(v) For fabric filters that are discharged to the atmosphere through a stack, the bag leak detector sensor shall be installed downstream of the fabric filter and upstream of any wet scrubber.

(vi) Where multiple detectors are required, the system's instrumentation and alarm may be shared among detectors.

(3) When operating a bag leak detection system, if an alarm sounds, conduct visual monitoring of the monovent or fabric filter outlet stack(s) as required in paragraph (a)(1) of this section within 1 hour. If the visual monitoring reveals the presence of any VE, the permittee shall conduct a Method 22 test following the requirements of 40 CFR 63.11528(b)(1) within 24 hours of determining the presence of any VE.

(4) The permittee shall prepare a site-specific monitoring plan for each bag leak detection system. The permittee shall operate and maintain each bag leak detection system according to the plan at all times. Each plan must address all of the items identified in paragraphs (a)(5)(i) through (a)(5)(v)of this section.

(i) Installation of the bag leak detection system.

(ii) Initial and periodic adjustment of the bag leak detection system including how the alarm set-point and alarm delay time will be established.

(iii) Operation of the bag leak detection system including quality assurance procedures.

(iv) Maintenance of the bag leak detection system including a routine maintenance schedule and spare parts inventory list.

(v) How the bag leak detection system output will be recorded and stored.

(Ref.: 40 CFR 63.11527(a))

IV.26 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee is subject 40 63.11528 and shall comply with the Performance Testing and Compliance Requirements as follows:

(a) *Initial compliance demonstration deadlines.* The permittee shall conduct an initial Method 22 (appendix A-7 of 40 CFR part 60) test following the requirements of paragraph (b)(1) of this section of each existing

electrometallurgical operation control device and an initial Method 9 observation following the requirements of paragraph (c)(1) of this section from the furnace building due to electrometallurgical operations no later than 60 days after your applicable compliance date. For any new electrometallurgical operation control device, the permittee shall conduct an initial Method 22 test following the requirements of paragraph (b)(1) of this section within 15 days of startup of the control device.

(b) *Visible emissions limit compliance demonstration.*

(1) The permittee shall conduct a Method 22 (appendix A-7 of 40 CFR part 60) test to determine that VE from the control device do not exceed the emission standard specified in 40 CFR 63.11526(a). For a fabric filter, conduct the test for at least 60 minutes at the fabric filter monovent or outlet stack(s), as applicable. For a wet scrubber, conduct the test for at least 60 minutes at the outlet stack(s).

(2) The permitee shall conduct a semiannual Method 22 test using the procedures specified in paragraph (b)(1) of this section.

(c) *Furnace building opacity.*

(1) The permittee shall conduct an opacity test for fugitive emissions from the furnace building according to the procedures in 40 CFR 63.6(h) and Method 9 (appendix A-4 of 40 CFR part 60). The test shall be conducted for at least 60 minutes and shall include tapping the furnace or reaction vessel. The observation shall be focused on the part of the building where electrometallurgical operation fugitive emissions are most likely to be observed.

(2) Conduct subsequent Method 9 tests no less frequently than every 6 months and each time the permittee makes a process change likely to increase fugitive emissions.

(3) After the initial Method 9 performance test, as an alternative to the Method 9 performance test, the permittee may monitor VE using Method 22 (appendix A-7 of 40 CFR part 60) for subsequent semi-annual compliance demonstrations. The Method 22 test is successful if no VE are observed for 90 percent of the readings over the furnace cycle (tap to tap) or 60 minutes, whichever is longer. If VE are observed greater than 10 percent of the time over the furnace cycle or 60 minutes, whichever is longer, then the facility shall conduct another test as soon as possible, but no later than 15 calendar days after the Method 22 test using Method 9 (appendix A-4 of 40 CFR part 60) as specified in paragraph (c)(1) of this section.

(Ref.: 40 CFR 63.11528)

PART V
EMISSION POINT SPECIFIC
RECORDKEEPING AND/OR REPORTING REQUIREMENTS

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Recordkeeping and/or Reporting Requirement
AA-000 *(Entire Facility)*	PSD Construction Permit Issued Issuance Date	V.1	Performance Testing	Submit Results no later than 60 days following actual test
		V.2	Natural Gas Combustion	Maintain Records and Submit Semi-Annual Records of Usage Rate
		V.3	Silicon Production	Maintain All Records and Submit a Semi-Annual Production Report for each consecutive 12-month period
		V.4	NOx	Maintain All Records and Submit Semi-Annually to Demonstrate Compliance with consecutive 12-month period Individual and Combined Emission Limitations and/or Individual and Combined BACT Emission Limitation
			CO	
			SO2	
			VOC	
			PM/PM10	
			PM2.5	
			HAP	
			GHG (CO2e)	
AA-100 *(Raw Material Receiving and Handling Operations)*	PSD Construction Permit Issued Issuance Date	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
		V.6	Material Throughput Rate	Semi-Annual Report the Material Throughput Rate for each consecutive 12 month period
AA-201 *(Submerged Arc Furnaces)*	PSD Construction Permit Issued Issuance Date	V.7	NOx	Submit Semi-Annual Report of Emission from CEMs Data
			CO	
			SO2	
		V.8	VOC	Submit Semi-Annual Report of Emissions utilizing Data obtained from Performance Testing
			PM/PM10/ PM2.5	

Emission Point	Applicable Requirement	Condition Number	Pollutant/ Parameter	Recordkeeping and/or Reporting Requirement
AA-201 *(Submerged Arc Furnaces)*	40 CFR 60.264(c)	V.9	NSPS Subpart Z	Product Change Notification Report
AA-301 (Silicon Grinding and Milling)	PSD Construction Permit Issued Issuance Date	V.5	PM/PM10/ PM2.5	Maintain and Submit Semi-Annual Reports that the permittee is in compliance with the Dust Control Plan
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PSD Construction Permit Issued Issuance Date	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-403 *(Slag Handling and Storage)*	PSD Construction Permit Issued Issuance Date	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-404 *(Silica Fume Silo)*	PSD Construction Permit Issued Issuance Date	V.5	PM/PM10/ PM2.5	Submit Semi-Annual Reports that the permittee is incompliance with the Dust Control Plan
AA-501 *(Emergency Generators)*	PSD Construction Permit Issued Issuance Date	V.10	NOx	Maintain and Submit Semi-Annual Reports of Emissions and Use of Low Sulfur Fuel Oil for each consecutive 12-month period
			CO	
			SO2	
			VOC	
			PM/PM10/ PM2.5	
AA-000 *(Entire Facility)* **where applicable*	40 CFR 63.11529(a)	V.11	MACT Subpart YYYYYY	Initial Notification
	40 CFR 63.11529(b)	V.12		Notification of Compliance Status
	40 CFR 63.11529(c)	V.13		Annual Compliance Certification
	40 CFR 63.11529(d) through (g)	V.14		Recordkeeping Requirements

V.1 For Emission Point AA-000 (Entire Facility), the permittee shall submit all required performance testing results no later than 60 days from the actual performance test. (Ref.: PSD Construction Permit issued Issuance Date)

V.2 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the natural gas usage limitations and recordkeeping requirements for the previous consecutive 12-month period of the federally enforceable permit herein and for demonstrating that good combustion practices were implemented. (Ref.: PSD Construction Permit issued Issuance Date)

V.3 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the Silicon production limitation for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuanace Date)

V.4 For Emission Point AA-000 (Entire Facility), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the facility wide and individual BACT limits for NOx, CO, SO2, VOC, PM/PM10/PM2.5, HAP, and GHG (as CO2e) for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

V.5 For Emission Point AA-100 (Raw Material Receiving and Handling Operations), AA-301 (Silicon Grinding and Milling), AA-403 (Slag Handling and Storage), AA-402 and AA-402a (Unpaved Roads and Paved Roads and Plantwide Transport of Fugitive Emisisons) and AA-404 (Silica Fume Silo), the permittee shall submit semi-annual reports certifying that the permittee implemented and followed its Dust Control Plan for minimizing PM/PM10/PM2.5 emissions for the previous consecutive 12-month period for demonstrating compliance with the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

V.6 For AA-100 (Raw Material Receiving and Handling Operations), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the Material Throughput Rate Limitation for the previous consecutive 12-month period of the federally enforceable permit herein. (Ref.: PSD Construction Permit issued Issuance Date)

V.7 For AA-201 (Submerged Arc Furnaces), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the NOx, CO, and SO2 emission rates for the previous consecutive 12-month period of the federally enforceable permit herein, utilizing the CEMS technology data as described and required monitoring in Section IV. If this data is unavailable then the data of the contingency plan will be used to demonstrate compliance so that the permittee can demonstrate its emission rate for these pollutants at any given time to the MDEQ for demonstrating compliance with the individual BACT emission limits.

V.8 For Emission Point AA-201 (Submerged Arc Furnaces), the permittee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the VOC and PM/PM10/PM2.5 emission limitations for the previous consecutive 12-month

period of the federally enforceable permit herein. The permittee shall utilize performance test data and/or operational range data from the performance test and any other data for demonstrating compliance with the emission limitation. (Ref.: PSD Construction Permit issued Issuance Date)

V.9 For Emission Point AA-201 (Submerged Arc Furnace), the permitte shall comply with 40 CFR 60, Subpart Z and submit a written report of any product change to the MDEQ no later than 30 days after implementation of the product change. (Ref.: 40 CFR 60.264(c))

V.10 For Emission Point AA-501 (Emergency Generators), the permitee shall submit semi-annual records to be able to demonstrate sufficiently that the permittee is in compliance with the NOx, CO, SO2, VOC, PM/PM10/PM2.5 emission limitations of the federally enforceable permit herein for the previous consecutive 12-month period and is using Ultra Low Sulfur Diesel (ULSD) Fuel. (Ref.: PSD Construction Permit issued Issuance Date)

V.11 For Emission Point AA-000 (Entire Facility), the permittee shall notify the MDEQ no later than 120 days following startup of the affected source that the permitee is subject to 40 CFR 63 - Subpart YYYYYY as specified by 40 CFR CFR 63.11529(a). (Ref.: 40 CFR 63.11529(a))

V.12 For Emission Point AA-000 (Entire Facility), the permittee shall submit a Notification of Compliance Status within as required by 40 CFR 63.11529(b). This notification must include the following:

(a) The results of Method 22 (appendix A-7 of 40 CFR part 60) test for VE as required by 40 CFR 63.11528(a);

(b) If the permittee has installed a bag leak detection system, documentation that the system satisfies the design requirements specified in 40 CFR 63.11527(a)(3) and that the permittee has prepared a site-specific monitoring plan that meets the requirements specified in 40 CFR 63.11527(a)(5);

(c) The results of the Method 9 (appendix A-4 of 40 CFR part 60) test for building opacity as required by 40 CFR 63.11528(a).

(Ref.: 40 CFR 63.11529(b))

V.13 For Emission Point AA-000 (Entire Facility), the permittee shall comply with 40 CFR 63.11529(c) and submit an annual certification of compliance according to the following:

(a) The results of any daily or weekly visual monitoring events required by 40 CFR 63.11527(a)(1) and (b)(1), alarm-based visual monitoring at sources equipped with bag leak detection systems as required by 40 CFR 63.11527(a)(4), or readings outside of the operating range at sources using CPMS on wet scrubbers required by 40 CFR 63.11527(b)(4).

(b) The results of the follow up Method 22 (appendix A-7 of 40 CFR part 60)

tests that are required if VE are observed during the daily or weekly visual monitoring, alarm-based visual monitoring, or out-of-range operating readings as described in paragraph (a) of this section.

(c) The results of the Method 22 (appendix A-7 of 40 CFR part 60) or Method 9 (appendix A-4 of 40 CFR part 60) tests required by 40 CFR 63.11528(b) and (c), respectively.

(d) If the permittee operates a bag leak detection system for a fabric filter or a CPMS for a wet scrubber, submit annual reports according to the requirements in 40 CFR 63.10(e) and include summary information on the number, duration, and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero and span or other calibration checks, if applicable).

V.14 For Emission Point AA-000 (Entire Facility), the permittee shall keep records as specified in 40 CFR 63.11529(d) through (g) as follows for demonstrating complying with the Recordkeeping Requirements of 40 CFR 63-Subpart YYYYYY:

(a) The permittee shall keep the records specified in paragraphs (a)(1) through (a)(2) of this section.

(1) As required in 40 CFR 63.10(b)(2)(xiv), the permittee shall keep a copy of each notification that the permittee submitted to comply with this subpart and all documentation supporting any Initial Notification, Notification of Compliance Status, and annual compliance certifications that you submitted.

(2) You shall keep the records of all daily or weekly visual, Method 22 (appendix A-7 of 40 CFR part 60), and Method 9 (appendix A-4 of 40 CFR part 60) monitoring data required by 40 CFR 63.11527 and the information identified in paragraphs (a)(2)(i) through (a)(2)(v) of this section.

(i) The date, place, and time of the monitoring event;
(ii) Person conducting the monitoring;
(iii) Technique or method used;
(iv) Operating conditions during the activity; and
(v) Results, including the date, time, and duration of the period from the time the monitoring indicated a problem (e.g., VE) to the time that monitoring indicated proper operation.

(b) The permittee's records must be in a form suitable and readily available for expeditious review, according to 40 CFR 63.10(b)(1).

(c) As specified in 40 CFR 63.10(b)(1), The permittee shall keep each record for 5 years following the date of each recorded action.

(d) The permittee shall keep each records onsite for at least 2 years after the date of each

recorded action according to 40 CFR 63.10(b)(1). The permittee shall keep the records offsite for the remaining 3 years.

(Ref.: 40 CFR 63.11529(d) through (g))

Mississippi Department of Environmental Quality
PSD Air Quality Analysis Project Summary
for
Mississippi Silicon LLC
Tishomingo, Mississippi

Project Type: PER20130001 - NA-Air-Construction PSD

Application Received Date: August 16, 2013

MDEQ Permit Writer: Bonnie Morgan

MDEQ Modeling Contact: Jacqueline Evans

Facility Location: latitude of 38°, 48', 21.4" and longitude of 88°, 19', 15.5"

Facility Address: East of County Roads 210 and 365
Burnsville,MS 38833

Class 1 Areas within 300 km:	**Class 1 Area Distance (km)**	**Class 1 Type**
Sipsey	**90.92**	**Forest Service**
Breton	**530.33**	**Fish & Wildlife**
Upper Buffalo	**397.58**	**Forest Service**
Caney Creek	**522.85**	**Forest Service**
Mingo	**292.52**	**Fish & Wildlife**

Types of Emissions Units: Raw Material Receiving, Handling, and Storage Operations, Submerged Electric Arc Furnaces, Casting Frames, Preheaters, Grinding and Milling Operations, and other Plantwide Fugitive Operations including emergency support equipment.

Total Annual Emissions Increases:

Pollutant	**Emission Rate (TPY)**
NO_X	1,906.2
SO_2	2,170.1
PM	104.1
PM10	81.6
PM2.5	73.1
CO	1,444.3
VOC	93.5
H_2SO_4	0.021
Lead	0.075
Greenhouse Gases (CO2e)	402,396.76

Project Description:

MS Silicon is proposing the construction of a silicon manufacturing plant in Burnsville, Mississippi, which is located in Tishomingo County. The plant will consist of two (2) specific process areas:

- Silicon manufacturing; and
- Support operations.

The silicon manufacturing process will involve the mixing of quartz, coal, and wood in a semi-enclosed submerged arc furnace to produce 98% pure silicon. Further processing is performed to produce the 98% pure silicon in the form of an ingot or flake. The silicon manufacturing process will include the following operations with the potential to emit regulated air pollutants:

- Material handling and transfer to and from coal, wood and quartz storage piles;
- Storage yard for coal, wood and quartz storage piles;
- Wind erosion from coal, wood and quartz storage piles;
- Wood chipper (electric-fired);
- Casting frames;
- Raw material day bins with supporting baghouse(s);
- Four (4) semi-enclosed submerged arc furnaces (SAF) with four (4) baghouses;
- Four (4) ladle pre-heaters; and
- Product refining operations with supporting baghouse(s).

The silicon manufacturing process (i.e., the meltshop operations) will include melting, transferring and cooling operations. The raw material day bins, identified as emission group AA-101a, AA-102a and AA-103a, will be used to support the semi-enclosed submerged arc furnaces. The raw materials from the storage piles will be transferred to the raw material day bins before being loaded into the semi-enclosed submerged arc furnaces. Material will be mechanically (i.e., front end loaders or other types of equipment) moved to reclaim areas where the materials will be conveyed either underground or aboveground to the raw material day bins. The raw material day bins will then feed into one or more of the four (4) SAFs. The SAFs will then convert the coal, woodchips, and quartz into 98% pure silicon metal in molten form. Each SAF will be rated at approximately 25 megawatts per hour of input and will produce a design maximum of 2.75 tons of silicon per hour. The processes associated with producing the silicon will include raw material handling and silicon metal melting and tapping. Each SAF will be equipped with a baghouse for controlling PM emissions. Appropriate equipment will be installed on each SAF that will be used to duct furnace exhaust gases to the baghouse. These four (4) SAFs are identified as emission unit AA-201 and will produce 98-99% pure silicon metal. The submerged arc process is a reduction smelting operation. In the production of silicon metal, quartz is the raw material from which silicon is derived. Carbon is necessary as a reducing agent and is supplied by coal and woodchips and limestone is used as flux. Smelting in the SAF is accomplished by conversion of electric energy to heat. An alternating current applied to the electrodes

causes a current to flow through the charge from the electrode tips to the furnace hearth. This provides a reaction zone of temperature up to 3600 degrees F. To maintain a uniform electric load, electrode depth is continuously varied automatically, as required. At high temperatures in the reaction zone, the carbon sources react chemically with silicon dioxide gas to form carbon monoxide and silicon metal. Molten product from the SAFs will then be tapped from the SAF through a taphole located at the bottom of the SAF at hearth level. The molten metal and dross will flow from the taphole into a ladle. The ladle will be moved by a hoist to the casting process. The metal will be poured into low, flat pans that will provide rapid cooling of the molten metal. Fume and dust generated and captured throughout the production process including tapping will be controlled by the baghouses and then collected and reused or sold. The process will also include four (4) natural gas-fired ladle pre-heaters rated at 10.0 MMBtu/hr each, which will be used to provide additional heat for further processing of the molten silicon to silicon flakes. The natural gas-fired ladle pre-heaters are identified as emission unit AA-202. Due to the nature of this operation, potential emissions of criteria air pollutants including carbon monoxide (CO), nitrogen oxide (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC), particulate matter (PM) and greenhouse gases (primarily in the form of carbon dioxide (CO_2) may occur from a) smelting in the SAF; b) combustion of natural gas in the ladle pre-heaters; and c) material ladling and casting operations. Fume and dust generated and captured throughout this manufacturing process including tapping will be controlled by the baghouses which vents to a single exhaust stack associated with each SAF. The collected dust from the meltshop baghouses will then be collected and reused or sold. Four (4) baghouses will be used to capture and control PM emissions generated from the four (4) SAF operations. Good work practices will also be employed to minimize the release of regulated air pollutants f All of the emissions associated with natural gas combustion in the ladle pre-heater are considered fugitive in natural and will not be routed to a control device or through a stack. Each of the four (4) SAFs is considered a point source and will be controlled by its own baghouse. Each baghouse will have a stack with the following parameters:

- Stack Height – Approximately 300 feet above grade;
- Stack Diameter - 15 feet in diameter;
- Stack flow rate of 125,000 acfm; and
- Exhaust stack gas temperature of approximately 140 degrees F.

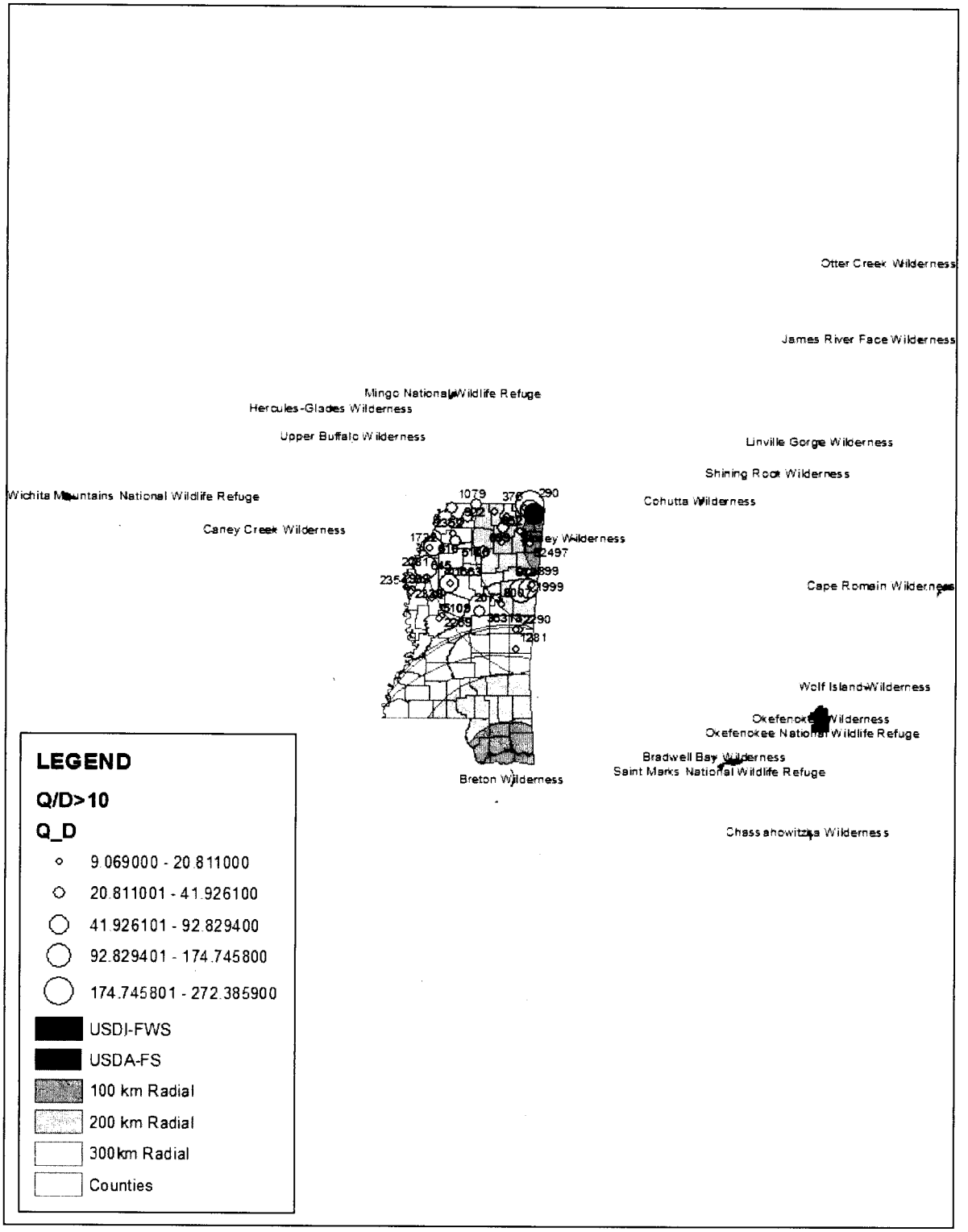
Silicon product refinement and handling occurs after the casting operations. After the metal has been cooled it will be crushed and sized to customer specifications. Any remaining undersized material will be re-melted during the casting process. The following emission units have been identified in the product refinement and handling operation (AA-301):

- AA-301 –Silicon grinding and milling operations.

The following plantwide operations and activities will support the entire plant and will also have the potential to emit regulated air pollutants. No further detail will be given

regarding these activities since this information can be found in the application and is general and not necessarily unique to Mississippi Silicon :

- Tank farm;
- Fugitive emissions from roadways;
- Slag handling;
- Silica fume silos:
- Facility-wide miscellaneous operations; and


Otter Creek Wilderness
James River Face Wilderness
Mingo National Wildlife Refuge
Hercules-Glades Wilderness
Upper Buffalo Wilderness
Linville Gorge Wilderness
Shining Rock Wilderness
Wichita Mountains National Wildlife Refuge
Cohutta Wilderness
Caney Creek Wilderness
Cape Romain Wilderness
Wolf Island Wilderness
Okefenoke Wilderness
Okefenokee National Wildlife Refuge
Bradwell Bay Wilderness
Saint Marks National Wildlife Refuge
Breton Wilderness
Chassahowitzka Wilderness
LEGEND
Q/D>10
Q_D
9.069000 - 20.811000
20.811001 - 41.926100
41.926101 - 92.829400
92.829401 - 174.745800
174.745801 - 272.385900
USDI-FWS
USDA-FS
100 km Radial
200 km Radial
300km Radial
Counties

Talking Points for Meeting with State Senator - PSD Permitting Process for MS Silicon

Typical process followed by a SIP-approved permitting authority (PA) in issuing PSD permits:

- PA determines if the permit application submitted by the source is "complete" (*i.e.*, contains all relevant information to allow processing)
- PA provides a copy of the complete application to EPA for initial review and comment
- PA prepares a draft permit (based on a complete application).
- PA publishes a notice of the draft permit to inform the public of: (1) the public comment period, usually 30 days, and (2) the deadline for requesting a hearing on the draft permit.
- EPA has the same review opportunity that is provided to the public and EPA typically sends comments to the PA via letter or email on the draft permit (especially if not all EPA's comments on the application were resolved).
- PA decides whether to revise the draft permit based on the comments received, including any from EPA; in some cases, the PA may publish another notice seeking comments on the revised permit. During this process, the PA may contact EPA for clarification/discussion of their comments.
- PA issues the final PSD permit and notifies EPA of permit issuance shortly thereafter.

Below is a summary of the actions in the case of MS Silicon (see previous RA Briefing paper for more details on our comments)

09/03/2013	Permit application (dated 08/15/2013) received
09/19/2013	EPA sends adverse comments on application
10/09/2013	MDEQ/MS Silicon respond to EPA comments on draft application
10/23/2013	Public notice published by MDEQ
10/24/2013	MDEQ preliminary determination received by EPA
11/14/2013	EPA sends adverse comments on preliminary determination to MDEQ
11/21/2013	EPA sends additional air quality comments to MDEQ
11/22/2013	End of public comment period
11/27/2013	MS Silicon final PSD permit issued by MDEQ
12/24/2013	MDEQ/MS Silicon respond to EPA comments on preliminary determination
02/12/2014	Globe Metallurgical requested formal hearing on permit with MDEQ
02/18/2014	Request for hearing denied by MDEQ
03/04/2014	Conference call between USW and EPA Region 4 to listen to their concerns
03/19 - 03/20/2014	Six (6) letters from Alabama state senators communicating the USW concerns with MS Si permit received by EPA Administrator
04/01/2014	Correspondence received from Santarella & Eckert LLC, as retained by the USW, with supplemental documentation of concerns with the MS Silicon permit
04/10/2014	Call between the APTMD Director and MDEQ Air Director occurs
04/14/2014	Deadline for responding to the six (6) letters from Alabama state senators

Current Actions

- EPA Region 4 is writing another letter detailing all the outstanding comments we have on MS Silicon
- Response letter drafted from Region 4 to Santarella & Eckert and is with Alison in Public Affairs for coordination with State Senators meeting

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

July 16, 2014

Ms. Maya Rao, Director
Air Division
Mississippi Department of Environmental Quality
Office of Pollution Control
P.O. Box 2261
Jackson, Mississippi 39225

Dear Ms. Rao:

On November 27, 2013, the Mississippi Department of Environmental Quality (MDEQ) issued a Prevention of Significant Deterioration (PSD) Permit to Mississippi Silicon LLC (MS Silicon). Since MDEQ has a PSD permitting program approved in the State Implementation Plan, your agency is the primary permitting authority for this facility. The Region 4 office of the U.S. Environmental Protection Agency submitted comments regarding the MS Silicon Preliminary Determination and draft PSD permit on November 14, 2013, and November 21, 2013. In a letter dated December 16, 2013, MDEQ provided a response to EPA's comments.

As you are aware, the EPA has continued to review the documents provided by MDEQ related to the permitting of the MS Silicon manufacturing facility and has identified certain issues and questions, primarily related to modeling, which remain outstanding with regard to this permit. The enclosure outlines what we consider to be the outstanding questions and issues. These questions and issues are related either to: EPA's previous comments to which the EPA would like further clarification; or, documents provided to the EPA after submission of the EPA's comments to MDEQ. Given that this is a construction permit, it is important that we work expeditiously to address outstanding issues, so we ask that you provide a response no later than 30 days from the date of this letter.

If you have any questions about these comments or require additional information, please contact me at 404-562-9077 or Katy Lusky of my staff at (404) 562-9130.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics Management Division

Enclosure

Enclosure – MS Silicon Outstanding Questions

1) Exclusion of Fugitive and Volume Emission Sources

According to the November 22, 2013, "Addendum #2 Updated Air Quality Impact Evaluation (Criteria Air Pollutants)," MS Silicon eliminated fugitive emission and volume source emissions because it concluded that their maximum impacts will be close to or within the facilities property boundary. To allow assessment of the appropriateness of this elimination, please provide supporting quantitative information on the number, location, and magnitude of the emissions excluded from the cumulative air quality assessment (*e.g.*, inventory of the eliminated fugitive and volume sources).

2) Use of Actual Emissions

The MS Silicon modeling used allowable emissions except for the modeling relating to compliance with the one hour sulfur dioxide (SO_2) National Ambient Air Quality Standards (NAAQS) and the one hour nitrogen dioxide (NO_2) NAAQS in the November 2013 Addendum #2, where actual emissions were used. The use of actual emissions in the cumulative NAAQS compliance modeling is not supported by past or current practice nor by 40 CFR Part 51, Appendix W. Please provide a detailed technical explanation why this modelling approach is appropriate and in accordance with the current regulations, guidance, and accepted practice.

3) Modeled Receptor Grid

Please confirm that all modeled controlling concentrations and/or concentrations exceeding ambient standards, and concentrations challenging these concentrations (*e.g.*, greater than 90% of the values), have been modeled with 100-meter grid resolution. If this was not the case, please provide information showing the actual grid resolution and explain why this grid resolution is appropriate. Also, please provide an explanation of why the 100-meter grid resolution was not used and discuss any potential differences in outcome from the use of a different grid.

4) Plant roads, material handling and storage

Best management practices (BMP) are indicated as the methods for controlling emissions from bulldozing storage areas, vehicle road traffic, vehicle transport of raw product, and wind erosion from coal/wood/quartz/slag storage. Please provide a detailed technical justification for the selection of these unusually high control efficiencies for the BMPs which includes an explanation of how the control efficiencies will be reached.

5) $PM_{2.5}$ Impact Analysis

Please provide the technical basis for the assumption that the baghouse will capture a majority of the secondary $PM_{2.5}$ emissions (*i.e.*, nitrates and sulfates). Please note that guidance for this evaluation is the "Guidance for $PM_{2.5}$ Permit Modeling," proposed in 2013 and finalized in 2014.

6) Two-Prong Culpability Contribution Analysis

To address the project's contribution to modeled NAAQS violations, a unique, two-prong procedure was used. The first prong consisted of modeling the project's impacts along a straight line from the project to the nearby source assumed to cause the violation. It was assumed that the maximum interaction between these sources would occur along the straight line path downwind of the other source with no consideration of real atmospheric conditions where plumes interact. The second prong, which is also addressed above in comment #2, is a cumulative NAAQS compliance assessment performed using actual emissions, rather than permit allowable emissions, for the facilities contributing most to the modeled violations. Please provide the technical basis for accepting this two-prong culpability approach used to demonstrate no significant project impact to all modeled NAAQS exceedances.

7) Modeling Procedure for 1-Hour NO_2

The use of actual emissions (*see* EPA questions 2 and 6, above) for the two significant nearby facilities reduced the number of modeled NO_2 violations but MS Silicon significantly contributed to some of the remaining modeled violations. An 8-step process was used to resolve MS Silicon's contribution to the modeled NO_2 violations but only for "critical" receptors, as described in the application. This process does not address significant contribution by MS Silicon to all model concentrations exceeding the NAAQS. Please provide the technical basis for the conclusion that there are no significant project contributions to any modeled concentration exceeding the NAAQS.

8) Impacts to Soils and Vegetation

Given the modeled NAAQS violations for the 1-hour SO_2 and NO_2, the statement in Section 4.2 that the maximum predicted NO_2 ambient concentrations are below the ambient air quality standards is unsupported. The results of the NAAQS compliance modeling (*i.e.,* cumulative impacts) should be used for comparison to the target values in Tables 4-1. Please provide the technical basis for assessment of soils and vegetation impacts.

9) PSD Class II Visibility Assessment

The applicant did not include a visibility impairment assessment of the project's impact in the PSD Class II area (*i.e.,* project's impact area). Please provide the technical basis for the conclusion that this analysis was not needed for this project.

10) PSD Class I Area Significant Impact Level (SIL) Assessment

MS Silicon's PSD Class I area (Sipsey Wilderness Area) SO_2 impact assessment was greater than the SIL. A cumulative impact assessment was not performed based on the applicant's statement that it was not aware of any other significant PSD increment consuming SO_2 source that would impact the Sipsey Wilderness Area. The basis for this statement was not provided. Please provide the steps taken to identify other significant PSD increment consuming SO_2 sources that could impact the Sipsey Wilderness Area. If sources are indeed identified, please provide a cumulative impact assessment or the technical basis for why an assessment is not needed.

STATE OF MISSISSIPPI
PHIL BRYANT
GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
GARY C. RIKARD, EXECUTIVE DIRECTOR

September 4, 2014

Ms. Beverly H. Banister, Director
Air, Pesticides and Toxics Management Division
U.S. EPA, Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street
Atlanta, GA 30303-8960

Dear Ms. Banister:

Mississippi Silicon LLC (MS Silicon) submitted an application dated August 15, 2013, for a Prevention of Significant Deterioration (PSD) permit to construct a new silicon manufacturing facility to be located near Burnsville, Mississippi in Tishomingo County. The proposed silicon manufacturing facility would utilize two (2) semi-enclosed submerged arc furnaces to produce 98-99% pure silicon metal. The public comment period for the proposed project began on October 24, 2013 and closed on November 22, 2013. On November 27, 2013, the Mississippi Environmental Quality Permit Board issued a Prevention of Significant Deterioration (PSD) permit to construct air emission equipment to MS Silicon LLC, granting permission to construct air emissions equipment to comply with federally enforceable emission limitations, monitoring requirements and other conditions set forth in the construction permit.

In a letter dated July 16, 2014, the Region 4 office of the U.S. Environmental Protection Agency provided additional comments regarding the air quality analysis for the proposed project to construct and operate a new silicon manufacturing facility. Following are MDEQ's response to EPA Region 4 comments. For clarity, EPA Region 4's comments are restated in bold type and are followed by MDEQ's response in italics.

1. **Exclusion of Fugitive and Volume Emission Sources**

   According to the November 22, 2013, "Addendum #2 Updated Air Quality Impact Evaluation (Criteria Air Pollutants)," MS Silicon eliminated fugitive emission and volume source emissions because it concluded that their maximum impacts will be close to or within the facilities property boundary. To allow assessment of the appropriateness of this elimination, please provide supporting quantitative information on the number, location, and magnitude of the emissions excluded from the cumulative air quality assessment (e.g., inventory of the eliminated fugitive and volume sources).

MDEQ Response: *All emission units included in the modeling analysis were documented in Table 2-1, Emission Inventory, of Addendum #2, dated November 22, 2013. Table 2-1 lists the identifiers (point source, volume source, area source, etc...) assigned to these sources, stack parameters, and the emission rates used in the model. Fugitive sources such as haul roads, storage piles, and material handling operations were identified and included in the modeling analysis. Source emissions were calculated using best available data or estimating techniques. These calculations are provided in Table 2-3 thru Table 2-7, Potential Emissions of Regulated Air Pollutants.*

2. **Use of Actual Emissions**

The MS Silicon modeling used allowable emissions except for the modeling relating to compliance with the one hour sulfur dioxide (SO_2) National Ambient Air Quality Standards (NAAQS) and the one hour nitrogen dioxide (NO_2) NAAQS in the November 2013 Addendum #2, where actual emissions were used. The use of actual emissions in the cumulative NAAQS compliance modeling is not supported by past or current practice nor by 40 CFR Part 51, Appendix W. Please provide a detailed technical explanation why this modelling approach is appropriate and in accordance with the current regulations, guidance, and accepted practice.

MDEQ Response: *In the NAAQS analysis, the potential emissions from all emission units at the proposed MS Silicon facility were combined with the emissions of all nearby sources that had significant impacts within the proposed source's impact area and were modeled using the AMS/EPA Regulatory Model (AERMOD) version 12345 to compute the cumulative impacts from SO_2 and NO_2. The SO_2 and NO_2 air emission inventories for nearby sources were obtained from MDEQ, the Alabama Department of Environmental Management (ADEM) and the Tennessee Department of Environment and Conservation. The resulting model calculated concentrations, added to the representative background level for each pollutant, were assessed against the applicable NAAQS. Background concentrations for inclusion in the NAAQS analysis were provided by MDEQ. The initial NAAQS analysis was performed using maximum (federally enforceable) allowable emission rates or potential to emit. The initial SO_2 and NO_2 NAAQS compliance demonstration resulted in predicted concentrations that were in excess of the 1-hour NAAQS for SO_2 and NO_2.*

Further evaluation performed by MS Silicon revealed that the predicted concentrations exceeding the SO_2 and NO_2 NAAQS were caused by two sources that were determined to be the primary contributors to the predicted concentrations that were above the 1-hour NAAQS.

Listed below are the names of the two existing facilities that have emissions sources that were determined by EPA's AERMOD dispersion model to result in concentrations above the 1-hour SO_2 and NO_2 NAAQS based on their allowable emission rates.

- *Columbia Gulf Transmission located in Alcorn County, Mississippi approximately 19 kilometers northeast of the MS Silicon facility site; and*

- *TVA Colbert located in Colbert County, Alabama approximately 44 kilometers east south east of the MS Silicon facility site.*

Per review of the Memorandum, "Use of Allowable Emissions for National Ambient Air Quality Standards (NAAQS) Impact Analysis Under the Requirements for Prevention of Significant Deterioration (PSD)", dated March 16, 1989, from John Calcagni; if the NAAQS analysis revealed modeled exceedances, adjustments to the allowable emission rate could be made (use actual emissions) if it can be satisfactorily demonstrated that historical operating levels and/or operating factors will be representative of future conditions.

In addition, the US EPA memorandum "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2, National Ambient Air Quality Standard" states:

> *Concentration gradients associated with a particular source will generally be largest between the source location and the distance to the maximum ground-level concentrations from the source. Beyond the maximum impact distance, concentration gradients will generally be much smaller and more spatially uniform. A general "rule of thumb" for estimating the distance to maximum 1-hour impact and the region of significant concentration gradients that may apply in relatively flat terrain is approximately 10 times the source release height. For example, the maximum impact area and region of significant concentration gradients associated with a 100 meter stack in flat terrain would be approximately 1,000 meters downwind of the source, with some variation depending on the source characteristics affecting plume rise. However, the potential influence of terrain on maximum 1-hour pollutant impacts may also significantly affect the location and magnitude of concentration gradients associated with a particular source. Even accounting for some terrain influences on the location and gradients of maximum 1-hour concentrations, these considerations suggest that the emphasis on determining which nearby sources to include in the modeling analysis should focus on the area within about 10 kilometers of the project location in most cases. The routine inclusion of all sources within 50 kilometers of the project location, the nominal distance for which AERMOD is applicable, is likely to produce an overly conservative result in most cases.*

The guidance further states:

> *EPA's Guideline on Air Quality Models provides recommendations regarding air quality modeling techniques that should be applied in the preparation or review of PSD permit applications and serves as a "common measure of acceptable technical analysis when supported by sound scientific judgment." 40 CFR Part 51, Appendix W, section 1.0.a. While the guidance establishes principles that may be controlling in certain circumstances, the guidelines are not a strict modeling cookbook, so that, as the guideline notes, "case-by case analysis and judgment are frequently required. "Section1.0.c., in particular, with respect to emissions input data, Section 8.0a., of Appendix W establishes the general principle that "the most appropriate data available should always be selected or use in modeling analysis," and emphasizes the importance of "the exercise of professional judgment by the appropriate*

reviewing authority" in determining which nearby sources should be included in the model emission inventory. Section 8.2.3.b.

It should be noted that the closest competing source is slightly less than 13 kilometers from the proposed facility. The tallest stack for competing sources is 183 meters. Within the reasoning of the EPA guidance memorandum, the project could have been evaluated using monitored background data in conjunction with the modeled project emissions. At most, the competing sources included within the model would be considered "other sources" as defined in Appendix W.

TABLE 8–1.—MODEL EMISSION INPUT DATA FOR POINT SOURCES of Appendix W defines the operating factor for the short term modeling of "other sources" to be the annual level when actually operating, averaged over the most recent two years. This operating factor is to be combined with the maximum allowable emission limit considering continuous operation. The actual emissions are, arguably, a more accurate representation of the Appendix W requirement than the potential emissions for "other sources." Given the inclusion of a conservative background coupled with the inclusion of all competing sources from the inventory, the applicant has presented a conservative estimate of the impact on air quality surrounding the facility.

The competing sources could have justifiably been excluded from the modeling analysis. The inclusion of the competing sources at actual emission levels provide a conservative estimate of the future air quality and are protective of the NAAQS.

3. **Modeled Receptor Grid**

Please confirm that all modeled controlling concentrations and/or concentrations exceeding ambient standards, and concentrations challenging these concentrations (e.g., greater than 90% of the values), have been modeled with 100-meter grid resolution. If this was not the case, please provide information showing the actual grid resolution and explain why this grid resolution is appropriate. Also, please provide and explanation of why the 100-meter grid resolution was not used and discuss any potential differences in outcome from the use of a different grid.

MDEQ Response: *Maximum impacts from the proposed facility were defined within 100-meter spacing. The increase in ambient air quality due to the project was below 90% of the SIL.*

Also, Section 7.2.2., of the "Guideline on Air Quality Models" addresses critical receptor sites and states:

> *Receptor sites for refined modeling should be utilized in sufficient detail to estimate the highest concentrations and possible violations of a NAAQS or a PSD increment. In designing a receptor network, the emphasis should be placed on a receptor resolution and location, not total number of receptors. The selection of receptors sites should be a case-by-case*

determination taking into consideration the topography, the climatology, monitor sites, and the results of the initial screening procedure.

This section makes no mention of a defined receptor grid spacing or concentrations challenging the controlling concentrations. The receptor grid used defined the maximum impacts from the project within 100-meter spacing, which is of sufficient detail to estimate the highest concentrations caused by the project and possible violations of a NAAQS or PSD increment.

4. **Plant roads, material handling and storage**

Best management practices (BMP) are indicated as the methods for controlling emissions from bulldozing storage areas, vehicle road traffic, vehicle transport of raw product, and wind erosion from coal/wood/quartz/slag storage. Please provide a detailed technical justification for the selection of these unusually high control efficiencies for the BMPs which includes an explanation of how the control efficiencies will be reached.

MDEQ Response: *BMP for the various fugitive type emission sources associated with the MS Silicon facility will utilize various practices including a) inclusion of 3-sided windscreen barriers (where technical feasible), b) use of chemical stabilization and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions. The fugitive dust control plan is to include such control techniques as controlling with water, dust suppressants, wind screens, vehicle speed reduction and vacuuming or sweeping of facility roads, as required. The control efficiency/technology information provided by MS Silicon was based on available guidance on what levels of control (and control efficiencies) can be reasonably anticipated certain types of emission units and pollutants. This type of information was obtained from federal guidance documents, published literature, permitting agencies, as well as information and analysis discussed in technical reports such as the Western Regional Air Partnership (WRAP) Fugitive Dust Handbook* ***(http://wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf)****. The WRAP Fugitive Dust Handbook addressed:*

- *Factors affecting fugitive dust emissions*
- *The estimation of uncontrolled fugitive dust emissions*
- *Emission reductions achieved by control techniques for fugitive source categories such as the mineral products industry, materials handling operations, paved/unpaved haul roads, and material storage piles; and*
- *Incorporates available information from both the public (federal, state, and local air quality agencies) and private sectors that address options to reduce fugitive dust emissions.*

The methods for estimation of dust emissions rely primarily on EPA's AP-42 with references to alternative methods adopted by state and local control agencies. A list of fugitive dust control measures that have been implemented by jurisdictions designated by the U.S. EPA as nonattainment for federal PM_{10} standards are presented in the table below:

Source Category	*Control Measure*	*Published PM_{10} Control Efficiency*
Material Handling	*Implement wet suppression*	*50 – 90%*
	3-sided enclosure around storage piles	*75%*
	Covered storage pile with a tarp during high winds	*90%*
Paved Roads	*Sweeping*	*4 – 26%*
	Minimize trackout	*40 – 80%*
	Remove deposits from road as soon as permitted	*>90%*
Unpaved Roads	*Limit vehicle speed to 25 mph*	*44%*
	Apply water	*10 – 74%*
	Apply dust suppressant	*84%*
	Pave surface	*>90%*
Mineral Products Industry	*Cyclone*	*68 – 79%*
	Wet Scrubber	*78 – 98%*
	Fabric Filter	*99 – 99.8%*
	Electrostatic Precipitator	*90 – 99.5%*
Wind Erosion (agricultural, open area, and storage piles)	*Plant trees or shrubs as a wind break*	*25%*
	Create cross-wind ridges	*24 – 93%*
	Erect artificial wind barriers	*4 – 88%*
	Apply dust suppressant or gravel	*84%*
	Revegetate; apply cover crop	*90%*
	Watering	*90%*

5. $PM_{2.5}$ Impact Analysis

Please provide the technical basis for the assumption that the baghouse will capture a majority of the secondary $PM_{2.5}$ emissions (i.e., nitrates and sulfates). Please note that guidance for this evaluation is the "Guidance for $PM_{2.5}$ Permit Modeling," proposed in 2013 and finalized in 2014.

MDEQ Response: *MS Silicon reviewed the Memorandum, "Guidance for $PM_{2.5}$ Permit Modeling", dated May 20, 2014, from Stephen D. Page. The memorandum discusses guidance on demonstrating compliance with the fine $PM_{2.5}$ NAAQS and PSD increment with regards to consideration of the secondary formed component of $PM_{2.5}$. $PM_{2.5}$ compliance demonstration would be required for direct $PM_{2.5}$ emissions based on dispersion modeling and MS Silicon would have to account for impacts of NOx and SO_2 precursor emissions. As discussed in Section IV of*

that memorandum a cumulative impact analysis for $PM_{2.5}$ NAAQS compliance should include the following components:

- *Proposed new or modifying source*
    - *Primary impacts on $PM_{2.5}$, i.e., form direct $PM_{2.5}$ emissions*
    - *Secondary impacts on $PM_{2.5}$, i.e., form precursor (NO_x and/or SO_2) emissions and;*
    - *Based on information compiled by USEPA, sulfates are typically associated with industrial combustion and power generation and nitrates are associated with cars, trucks, industrial combustion, and power generation*
- *Nearby sources*
    - *Primary impacts on $PM_{2.5}$ as appropriate*
- *Monitored background of $PM_{2.5}$ that accounts for secondary $PM_{2.5}$ impacts from regional transport, secondary $PM_{2.5}$ impacts from nearby sources, and primary $PM_{2.5}$ impacts from background sources not included in the modeling inventory.*

Provided below is additional information assembled by MS Silicon to further support the $PM_{2.5}$ NAAQS cumulative analysis, taking into account theoretical $PM_{2.5}$ secondary formation. The additional information assembled regarding secondary $PM_{2.5}$ formation by MS Silicon follows the Appendix C example provided by USEPA in the May 20th, 2014 technical memorandum.

1. ***Background $PM_{2.5}$ Monitored Data*** *– A background $PM_{2.5}$ monitor is located in Grenada County and has been determined to be representative of the air quality in the vicinity of the MS Silicon manufacturing facility (Tishomingo County). Both counties are rural in nature, have very similar population densities (i.e., based on the 2010 census around 20,000 individuals), cover about the same overall square miles, and have light to moderate industry. The Grenada monitor has been collecting $PM_{2.5}$ measured concentrations following EPA/State monitoring requirements, procedures and quality control requirements for several years. This monitor based on its location and similar regional industrial background should be measuring ambient $PM_{2.5}$ concentration that should be very similar to that found in the area surrounding the MS Silicon facility site. The $PM_{2.5}$ data collected by this monitor should also be measuring direct and secondary $PM_{2.5}$ sources either located in the county or through regional transport. The 2012 design value concentrations obtained from this monitor were 9.5 ug/m^3 for an annual averaging period and for the 24-hour averaging period the concentration measured was 19 ug/m^3.*

   The MDEQ maintains a $PM_{2.5}$ ambient monitoring network throughout the state of Mississippi. Figures 2-8a and 2-8b (which were provided in Addendum #2) present the 2012 annual average and 24-hour average design values for $PM_{2.5}$ expressed in

ug/m3, respectively for each monitoring site located throughout Mississippi. Information that can be extracted from these figures is as follows:

- *$PM_{2.5}$ annual average design concentrations range from 9.5 ug/m^3 to 11.6 ug/m^3 across the entire state of Mississippi. These concentrations reflect measured $PM_{2.5}$ values in rural and urban areas; and*

- *$PM_{2.5}$ 24-hour average design concentrations range from 18 ug/m^3 to 22 ug/m^3 across the entire state of Mississippi. These concentrations reflect measured $PM_{2.5}$ concentrations in rural and urban areas.*

Since these measured concentrations reflect rural and urban areas and are located throughout the entire state, any secondary $PM_{2.5}$ impacts from large industrial sources, power generation plants and mobile sources are reflected in these measured concentrations. Based on this data it would suggest that the maximum amount of measured $PM_{2.5}$ concentrations that could theoretically occur from secondary $PM_{2.5}$ sources located throughout the entire state of Mississippi would be approximately 2 ug/m^3 for an annual averaging period and 4 ug/m^3 for a 24-hour averaging period.

A review of the $PM_{2.5}$ ambient concentration data collected in northwest Alabama at the Muscle Shoals monitor located in Colbert County for the period 2008-2010 revealed a 24-hour design concentration of 22 ug/m^3 and an annual average design concentration of 10.3 ug/m^3. These concentrations fall within the ranges measured throughout the state of Mississippi. $PM_{2.5}$ data for the state of Tennessee was not as extensive as that of Mississippi and Alabama, however, the $PM_{2.5}$ monitor located in Hamilton County, which is reflective of a large urbanized area showed a $PM_{2.5}$ 24-hour average concentration range of 17 ug/m^3 to 22 ug/m^3 and annual average concentration range of 9.9 ug/m^3 to 10.1 ug/m^3, again very similar $PM_{2.5}$ ambient concentration levels to those being measured in Mississippi and Alabama.

A closer comparison of the $PM_{2.5}$ data measured at the Grenada County, Mississippi monitor and Hinds County, Mississippi monitor show a difference of 2 ug/m^3 for a 24-hour averaging period and 1.5 ug/m^3 for the annual averaging period. The total emissions (primary combustion sources) of NO_x expressed in short tons for calendar year 2011 were approximately 1200 tons (daily average of 3.3 tons/day) in Grenada County and 9000 tons (daily average of 24.7 tons/day) in Hinds County. If we make a conservative assumption and assume the difference in tons of NO_x caused the difference in the measured $PM_{2.5}$ concentration at the Grenada monitor to the Hinds monitor to increase by 2 ug/m^3 (i.e., caused by secondary $PM_{2.5}$ formation) an emission factor can be derived which could represent secondary formation. Thus it takes approximately 21.4 tons/day of NOx emissions to cause a 2 ug/m^3 change in $PM_{2.5}$ emission over a 24-hour averaging period. Since the MS Silicon facility is permitted to release approximately 2, 000 tons/year (which is approximately 505 tons/day) of NO_x emissions, the theoretical conversion of these emissions to $PM_{2.5}$,

would be approximately 0.5 ug/m^3 over a 24-hour average period, which is insignificant.

Another example is that the $PM_{2.5}$ measured concentrations across Mississippi and Alabama do not seem to show that $PM_{2.5}$ emissions from secondary formation result in hot spot $PM_{2.5}$ impacts. What is meant by that statement is that if secondary $PM_{2.5}$ formation was a significant contributor to $PM_{2.5}$ air quality, ambient monitors would show a larger difference or variation in $PM_{2.5}$ impacts from rural to urban locations and in the vicinity of large power generation plants. The data shows consistency throughout the region with small variations in concentrations for both the 24-hour and annual concentrations. For example the TVA Colbert power plant is located in Colbert County, Alabama. This plant has actual emission of approximately 13,000 tons/year of SO_2 (average over 2012 and 2013) and approximately 6,700 tons/year of NO_x (average over 2012 and 2013). The monitoring network established in Alabama shows minimal variation across the entire state and the monitors located downwind of the TVA Colbert plant show no significant change in $PM_{2.5}$ concentrations from that shown within the region.

Consequently from the above two examples it can be concluded that potential emissions of SO_2 and NO_x from the MS Silicon facility which are significantly less than that associated with sources located in Hinds County, Mississippi, as well as that of the TVA Colbert power plant (less than 15% of the total actual emissions of NO_x and 30% of the actual emissions of NO_x emitted by the TVA Colbert plant) should have minimal effect on $PM_{2.5}$ impacts from secondary $PM_{2.5}$ formation.

2. ***Modeled Primary $PM_{2.5}$ Impacts from MS Silicon Facility*** *– Modeled primary $PM_{2.5}$ impacts form the MS Silicon facility using worst case operating condition and using a conservative "first Tier" approach, which involves combining modeled primary $PM_{2.5}$ impacts with a monitored background $PM_{2.5}$ concentrations were below the 24-hour and annual $PM_{2.5}$ NAAQS. Modeled maximum 24-hour and annual average concentrations from the facility based on operation of two (2) submerged arc furnaces and supporting operations are approximately 5 ug/m^3 and 1.0 ug/m^3, respectively. These concentrations represent less than 15% and less than 10% of the corresponding $PM_{2.5}$ NAAQS, respectively. Combining these predicted concentrations with a representative background concentration results in a $PM_{2.5}$ 24-hour average concentration of approximately 24 ug/m^3 which is roughly 69% of the 24-hour $PM_{2.5}$ NAAQS, and for the annual average concentration, the combined impact would be 10.5 ug/m^3 which is approximately 88% of the annual $PM_{2.5}$ NAAQS.*

3. ***Secondary $PM_{2.5}$ impacts associated with the MS Silicon facility.*** *As shown in item 2 above predicted concentrations from emissions of direct $PM_{2.5}$ when combined with a representative $PM_{2.5}$ background concentration are below the $PM_{2.5}$ 24-hour and annual average NAAQS concentrations. In the event emissions of SO_2 and NO_2 released from the MS Silicon facility would chemically react to form secondary $PM_{2.5}$,*

this would occur over time and distance and the points of maximum $PM_{2.5}$ impact from secondary formation would be different than the impacts from direct $PM_{2.5}$ emissions. As a result, it is highly unlikely that the maximum concentrations discussed in item 2 above would actually increase. The resultant concentration from secondary PM2.5 formation would most likely be less than that stated in item 2.

4. ***Secondary $PM_{2.5}$ Formation Statewide NO_x Emissions/ Large Coal Fired Power Plants.*** *As discussed in item #1 above, NO_x emissions and SO_2 emissions (potential $PM_{2.5}$ precursors) that are authorized under the permit issued by the MDEQ for the MS Silicon facility, in comparison to statewide emissions, as well as the actual emissions from the TVA Colbert coal fired power plant, are a fraction of those emission rates and actual measured $PM_{2.5}$ concentrations in Mississippi and Alabama and show minimal variation across the PM2.5 monitors in these states. Therefore, it does not appear that a significant change in $PM_{2.5}$ concentrations will occur because of secondary formation of $PM_{2.5}$ emissions from the MS Silicon facility.*

5. ***Cumulative Impact Analysis Conservative Assumption.*** *There are other conservative assumptions that have been included in the $PM_{2.5}$ cumulative impact analysis. This included operation of the plant under worst case operating conditions, including emissions from other nearby sources based on permit allowable, thus assuming they will also be operating at their worst case operating conditions, and the conservative approach when the design background concentration from a representative $PM_{2.5}$ monitor is added to the maximum modeled predicted $PM_{2.5}$ concentration. It is very unlikely that all of these worse case variables will occur at the same time and space. Thus the predicted $PM_{2.5}$ impacts form the proposed MS Silicon facility are very conservative and should have sufficient leeway to accommodate any minor change in $PM_{2.5}$ concentrations based on secondary $PM_{2.5}$ impacts.*

Based on the above factors, MS Silicon is confident that sufficient information / data has been assembled that demonstrates the silicon manufacturing facility being constructed in Burnsville, Mississippi will not cause or contribute to an exceedance of the $PM_{2.5}$ annual and 24-hour NAAQS taking into account the fact that the overall impacts of secondary $PM_{2.5}$ formation within the area of impact, as well as within the region should be minimal.

6. Two-Prong Culpability Contribution Analysis

To address the project's contribution to modeled NAAQS violations, a unique, two-prong procedure was used. The first prong consisted of modeling the project's impacts along a straight line from the project to the nearby source assumed to cause the violation. It was assumed that the maximum interaction between these sources would occur along the straight line path downwind of the other source with no consideration of real atmospheric conditions where plumes interact. The second prong, which is also addressed above in comment #2, is a cumulative NAAQS compliance assessment performed using actual emissions, rather than permit allowable emissions, for the facilities contributing most to the modeled violations. Please provide the technical basis for accepting this two-prong culpability approach used to demonstrate no significant project impact to all modeled NAAQS exceedances.

MDEQ Response: *In order to perform the SO_2 and NO_2 1-hour NAAQS compliance demonstration it is important to understand the statistical form of the NAAQS, how concentration are determined within the model "AERMOD" and how the model incorporates the five years of hourly meteorological data. AERMOD predicts 1-hour concentrations from each emission source associated with the facility on each receptor included in the analysis for each hour of the meteorological data set being utilized. The emission sources and meteorology are steady state for each hour being evaluated. Which means for each hour of the meteorological data (i.e., 8,760 hours in a non-leap year), the sources emission rate is fixed and the wind direction, wind speed, stability, temperature, etc. are also fixed or constant for that 1-hour period. As a result there will be no variation of the source emission rate or meteorological conditions during a 1-hour period.*

The statistical form of the SO_2 and NO_2 1-hour NAAQS as define by USEPA, are as follows:

- *SO_2 1-hour NAAQS – 99th percentile of 1-hour daily maximum concentrations averaged over 3-years. The 99th percentile correlates to the fourth (4th) highest modeled predicted concentration at a given receptor point as determined by AERMOD. USEPA has stated that the 99th percentile is the annual distribution of the daily maximum 1-hour concentrations averaged across the number of years being modeled.*

- *NO_2 1-hour NAAQS – 98th percentile of 1-hour daily maximum concentrations averaged over 3-years. The 98th percentile correlates to the eight (8th) highest modeled predicted concentration at a given receptor point as determined by AERMOD. USEPA has stated that the 98th percentile is the annual distribution of the daily maximum 1-hour concentrations averaged across the number of years being modeled.*

Provided below is a summary of the modeling approach that was performed by MS Silicon to demonstrate worst case emissions of SO_2 and NO_2 from the silicon manufacturing facility would not cause or contribute to a violation of the corresponding 1-hour NAAQS, which are 196 ug/m3 and 188 ug/m3, respectively.

- ***Step 1*** *– The first step was to model using AERMOD, the maximum SO_2 and NO_x emission rates from each individual emission source associated with the MS Silicon facility AERMOD was used to determine the maximum 1-hour predicted concentrations of SO_2 and NO_2 using a five year hourly meteorological data base and defined grid of receptor points. This initial evaluation included four (4) submerged arc furnaces and supporting operations. The maximum predicted 1-hour SO_2 and NO_2 concentrations are summarized in Tables 2-2 (comparison with Significant Impact Levels (SILs), 2-3 (comparison with Significant Monitoring Concentrations (SMC), 2-5 (comparison with PSD Class II increments) and 2-6 (comparison with NAAQS) of Addendum #2. The results provided in these tables demonstrate that the emissions of SO_2 and NO_x from the individual emissions sources associated with the MS Silicon facility in and by themselves would not cause or contribute to a violation of the corresponding NAAQS.*

- ***Step 2** – The second step involved determining if the emissions of SO_2 and NO_x from the sources at the MS Silicon facility would have a significant impact on SO_2 and NO_2 air quality. To determine if a significant impact occurs, the maximum predicted concentrations based on emissions of SO_2 and NO_x from the MS Silicon facility, as determined from AERMOD, were compared to the significant impact levels (SILS) established by USEPA. As shown in Table 2-2 of Addendum #2, emissions of SO_2 and NO_x from the MS Silicon facility did result in predicted concentrations above the corresponding SILs. As discussed in Section 2.8 of Addendum #2, predicted concentrations were above the corresponding SILs and the distance to which predicted concentrations from the MS Silicon facility (i.e., operation of four submerged arc furnaces and supporting operations) were shown to be above the SILs, are listed below. Predicted concentrations of SO_2 and NO_2 beyond these distances are below the corresponding SILs:*

    - *SO_2 annual average – A distance of six (6) kilometers;*
    - *NO_2 annual average – A distance of six (6) kilometers; and*
    - *SO_2 and NO_2 1-hour averages – A distance of fifty (50) kilometers for both.*

  Refer to Addendum #1, dated October 10, 2013 which provides numerous figures showing the area that was predicted to be above the SO_2 and NO_2 SILS. Provide below is a listing of those figures and there content:

    - *Figure 8a depicts the extent of the NO_2 1-hour significant impact area based on operation of four submerged arc furnaces and supporting operations;*

    - *Figure 8b depicts the extent of the NO_2 1-hour significant impact area based on operation of two submerged arc furnaces and supporting operations;*

    - *Figure 8c depicts the extent of the NO_2 annual significant impact area based on operation of four submerged arc furnaces and supporting operations;*

    - *Figure 8d depicts the extent of the NO_2 annual significant impact area based on operation of two submerged arc furnaces and supporting operations;*

    - *Figure 9a depicts the extent of the SO_2 1-hour significant impact area based on operation of four submerged arc furnaces and supporting operations;*

    - *Figure 9b depicts the extent of the SO_2 1-hour significant impact area based on operation of two submerged arc furnaces and supporting operations; and*

    - *Figure 9e depicts the extent of the SO_2 annual significant impact area based on operation of four submerged arc furnaces and supporting operations.*

Since predicted concentrations of SO_2 and NO_x emissions from the MS Silicon facility are above the SILs, a third step was performed (discussed below) which involved a cumulative (i.e., also referred to as multi-source) impact evaluation to demonstrate that the combined concentration impacts from the MS Silicon facility's SO_2 and NO_x emission sources in combination with the existing sources with the potential to emit each of these regulated air pollutants would result in combined concentrations that would be below the corresponding NAAQS.

Knowing the extent of the significant area is also important since any existing source located within that significant impact area or causing a significant impact from its emissions sources on that area must be included in the cumulative NAAQS compliance demonstration. For any predicted concentrations above the NAAQS based on modeling the MS Silicon facilities emission sources and existing sources has to be further evaluated to determine if the MS Silicon facilities emission sources would have predicted concentrations that are significant on the same hour and receptor point predicted by AERMOD which exceeds the NAAQS. Refer to Step 3 below which describes the various evaluations performed by MS Silicon to demonstrate that emissions of SO_2 and NO_x from the silicon facility would not cause or contribute to an exceedance of the 1-hour NAAQS for SO_2 and NO_2, respectively.

- ***Step 3**- The third step involved evaluating the cumulative impacts from the SO_2 and NO_x emission sources associated with the MS Silicon facility and emissions of SO_2 and NO_x from other existing sources. The inventory of existing sources with potential SO_2 and NO_x emission sources were provided by the Mississippi, Alabama and Tennessee environmental regulatory agencies. These inventories contained the required source parameters for inclusion in a NAAQS compliance demonstration, including the allowable emissions of SO_2 and NO_2. These inventories were reviewed by MS Silicon and any emission sources located within 50-km of the predicted significant impact areas for SO_2 and NO_2 were evaluated for inclusion in the multi-source impact analysis using the "North Carolina 20D Rule". The "North Carolina 20D Rule", developed by the North Carolina Department of Environment and Natural Resources (NCDENR) Air Quality Section, excluded from the emissions inventory those sources where the facility-wide emission rates in tons/year is less than 20D, where D is the distance from the nearby source to MS Silicon for short term emissions and the distance from the nearby source to the nearest boundary of the significant impact area for long term emissions. Tables 3-1, 3-2, 3-3 and 3-4 in Addendum #2 provides these inventories along with identification of which existing emission sources were excluded based on the minimal threshold of emissions and distance.*

  Predicted SO_2 1-hour concentrations resulting from the cumulative impact evaluation summed with a representative background concentration are provided in Table 3-6 of Addendum #2. As shown in this table predicted concentrations obtained from AERMOD (based on permit allowable emission rates for the existing emission sources were significantly higher than the corresponding 1-hour NAAQS. A source culpability analysis

was performed and it was determined that one existing source, the TVA Colbert coal fired power plant resulted in predicted concentrations that were above the 1-hour SO_2 NAAQS based on permit allowable emissions from this plant by itself. The TVA Colbert plant is located in Colbert County, Alabama approximately 44 kilometers east south east of the MS Silicon facility site.

Further discussions were held with representatives from the MDEQ regulatory agency and it was determined that it would be appropriate to utilize actual operating conditions for the TVA Colbert plant's emissions sources. The resulting actual emissions based on these actual operating conditions were obtained from USEPA's Acid Rain database and are significantly less than the plant's permit allowables. As shown in Table 3-4b predicted SO_2 cumulative impacts were shown to be below the SO_2 1-hour NAAQS when evaluating with AERMOD based on actual emission rates. The approach of using actual operating conditions is allowed by USEPA's guidance as defined in Appendix W of 40 CFR Part 51. It is also important to note that the location of this plant is 44 kilometers from the proposed MS Silicon facility which would result in this plant being classified as an "other emission source". Also, information available through the Tennessee Valley Authority shows emissions of SO_2 (as well as emissions of NO_x) have dropped significantly from this plant over the past several years. The reductions in SO_2 emissions are based on strategies developed by TVA Colbert to reduce its overall emissions of SO_2 from this plant with process improvements. These process improvements are not reflective in the plant's permit allowable emission rates. These reductions in SO_2 emissions which are reflective of plant operations are a significant reason for using actual emissions versus allowable emissions in the cumulative-source SO_2 impact demonstration for the TVA Colbert plant. These actual emissions better reflect the operation of the TVA Colbert plant based on improvements to the equipment's actually operating parameters.

Prior to the use of actual operating conditions for the TVA Colbert plant to demonstrate compliance as discussed above, a worst case impact analysis was also performed (referred to as the first prong of a two prong analysis). This worst case impact analysis involved predicting through the use of AERMOD the worst case 1-hour impact from the MS Silicon facilities emissions of SO_2 downwind of the TVA Colbert plant. Because we are dealing with a one hour averaging period any wind direction blowing from a direction other than the west northwest would not be influenced significantly by emissions from the MS Silicon facility (refer to figure 3-1 in Addendum #2 for the relationship between the location of the MS Silicon facility and TVA Colbert plant). Thus, if there are predicted exceedances of the 1-hour SO_2 NAAQS based on permit allowable SO_2 emission rates from the TVA Colbert plant, the only time that MS Silicon could potentially provide additional impact is when the wind is blowing from the west northwest. Consequently we have drawn a straight line from the MS Silicon facility to the TVA Colbert plant. This is the direction that would cause the maximum contribution from the MS Silicon facility downwind of the TVA Colbert plant. In order to define the maximum impact (i.e., predicted 1-hour concentrations), receptors were placed along this line downwind of TVA

Colbert plant and AERMOD was rerun on these receptors points for each of the five years of meteorological data. Refer to Table 3-6a in Addendum #2 that summarizes the SO_2 predicted concentration at each receptor point included in that analysis for each individual year evaluated. As shown in this table all predicted SO_2 1-hour concentrations based on operation of four submerged arc furnaces and supporting operations were below the corresponding 1-hour SIL. Consequently the proposed MS Silicon plant would not have a significant contribution to predicted concentrations resulting from the TVA Colbert plant when the wind was from the west northwest that would be in excess of the 1-hour SO_2 NAAQS.

Predicted NO_2 1-hour concentrations resulting from the cumulative impact evaluation summed with a representative background concentration are provided in Table 3-7a of Addendum #2. This table shows predicted 1-hour NO_2 concentrations to be several orders of magnitude above the 1-hour NO_2 NAAQS. A source culpability analysis was performed and it was determined that two existing source, the TVA Colbert coal fired power plant located in Colbert County, Alabama and the Columbia Gulf Transmission plant located in Alcorn County, Mississippi (approximately 19 kilometers to the northwest of the MS Silicon facility site) resulted in predicted concentrations that were above the 1-hour NO_2 NAAQS based on permit allowable emissions from these plants by themselves. Refer to Figure 3-1 in Addendum #2 that depicts the locations of these two plants in relationship to the MS Silicon facility.

In order to determine whether or not the MS Silicon facilities emissions of NO_x would significantly contribute to a predicted exceedance of the 1-hour NAAQS, various modeling evaluations were performed. Each evaluation performed is summarized below:

- *The first evaluation performed involved defining the maximum NO_2 contribution that the MS Silicon facility could provide downwind of Columbia Gas Transmission and TVA Colbert plants. Receptors were placed along the straight line between each source and downwind of the source. The same approach that was used for the SO_2 cumulative impact analysis discussed above was used as part of this NO_2 analysis. Table 3-7c of Addendum #2 shows that the maximum NO_2 contribution from the MS Silicon facility would be below the corresponding NO_2 1-hour SIL. However, in order to demonstrate that these predicted concentrations were below the 1-hour SIL, MS Silicon committed to operating no more than 2 of the 4 submerged arc furnaces simultaneously. This is essentially the same as cutting the potential emissions of NO_x from the facility by 50% during a 1-hour average period. Also included in this table is an adjustment factor to account for the transformation of NO_x to NO_2. Following USEPA guidance a conversion factor (Tier II) of 0.8 was employed. The predicted concentration obtained from AERMOD was multiplied by 0.8 to present the predicted NO_2 impact versus a NO_x impact concentration. As shown in table 3-7c all predicted NO_2 concentrations as contributed by MS Silicon would be below*

the NO_2 1-hour SIL, thus the facility would not cause or contribute to a predicted exceedance of the 1-hour NAAQS for any predicted exceedances that would be determined for receptors located to the northwest and southeast of the Columbia Gulf Transmission plant and TVA Colbert plant, respectively.

- *The second evaluation to further support the fact that the MS Silicon facility will not cause or contribute to a predicted exceedance of the 1-hour NO_2 NAAQS, was to determine whether or not the Columbian Gas Transmission and TVA Colbert plants would cause a predicted exceedance of the NO_2 1-hour NAAQS if allowable emissions were replaced with emission of NO_x that were reflective of actual operating conditions. The resulting predicted NO_2 1-hour concentrations were still above the corresponding 1-hour NO_2 NAAQS.*

- *Since predicted concentrations were still shown to be above the 1-hour NO_2 NAAQS based on using actual operating conditions to define the NOx emission rates for the two facilities, additional evaluations were performed. As discussed on page 3-27 multiple modeling runs were made to determine if the MS Silicon facility would contribute to an exceedance of the NO_2 1-hour NAAQS. Again because of the wind direction and receptor point locations being fixed during a given 1-hour period, predicted concentrations resulting from other existing facilities occurred when the wind directions were not lined up between the MS Silicon facility and the existing sources. So in short, exceedance of the 1-hour NAAQS were a result of those existing source and not because of the MS Silicon facility. Because this relationship was shown to occur and remained throughout the various evaluations performed, there was no reason to evaluate every 1-hour period and receptor period that exceeded the 1-hour NO_2 NAAQS.*

  To further support the conclusion defined above, MS Silicon performed an additional analysis which involved using the MAXCOUNT option of AERMOD. The MAXCOUNT option of AERMOD allows the user to define a concentration expressed in ug/m^3 and the model will determine and summarize each receptor / hour combination that resulted in a predicted concentration at or above that defined concentration. Using the MAXCOUNT option, MS Silicon reran AERMOD with the 5-years of meteorological data on the significant impact area receptor grid (over 5,000 receptor points). The defined concentration was set at 124 ug/m^3 within the AERMOD input file. Selection of this defined concentration caused AERMOD to identify all receptor / hour combinations for the 5-year period that were above the 124 ug/m^3. This concentration was selected since the combination of this concentration and a representative background concentration of 64 ug/m^3 would when combined correlate to the 1-hour NO_2 NAAQS of 188 ug/m^3. Two source groups were utilized in AERMOD, one group that had all the sources included in the cumulative NO_2 impact analysis and a second group with only two submerged arc furnaces and supporting equipment associated with the MS Silicon facility. For each predicted concentrations above

124 ug/m^3, the contribution from the MS Silicon facility was essentially zero ug/m^3. AEROMOD actually calculated a contribution from MS Silicon however those concentrations were less than 0.01 ug/m^3 on each predicted concentration in excess of 124 ug/m^3.

Based on all of the various evaluation performed above, there is sufficient data to adequately demonstrate that the MS Silicon facilities emissions of NO_x will not cause or contribute to a violation of the 1-hour NO_2 NAAQS. Because of this data and the conclusions drawn, MS Silicon does not see the need to perform any additional NO_2 modeling as part of the cumulative impact analysis to demonstrate what affect the MS Silicon facility would have on every receptor / hour combination throughout the five year meteorological data set that resulted in predicted exceedances of the 1-hour NO_2 NAAQS. It is also import to reiterate that MS Silicon has committed to operating no more than two of the four proposed submerged arc furnaces during any one-hour period. This operational restriction causes a significant reduction in the predicted contribution of the MS Silicon facility on ambient NO_2 air quality.

7. Modeling Procedure for 1-Hour NO2

The use of actual emissions (see EPA questions 2 and 6, above) for the two significant nearby facilities reduced the number of modeled NO2 violations but MS Silicon significantly contributed to some of the remaining modeled violations. An 8-step process was used to resolve MS Silicon's contribution to the modeled NO_2 violations but only for "critical" receptors, as described in the application. This process does not address significant contribution by MS Silicon to all modeled concentrations exceeding the NAAQS. Please provide the technical basis for the conclusion that there are no significant project contributions to any modeled concentration exceeding the NAAQS.

MDEQ Response: *Refer to the response provided by MS Silicon for Question #6 above. Numerous evaluations were performed by MS Silicon and based on MS Silicon committing to operating no more than two submerged arc furnaces during any 1-hour period MS Silicon has demonstrated that no significant impact should occur from the facility on any predicted 1-hour NAAQS exceedance. This was further reinforced with the five years of modeling runs that were performed using the MAXCOUNT feature of AERMOD and evaluating receptors contained within the significant impact area. As discussed in Response #6, predicted NO_2 concentrations from the MS Silicon facility for any receptor / hour combination above a predicted concentration of 124ug/m^3 for the five year meteorological period evaluated, showed an NO_2 impact of 0.01 ug/m^3 or less on each of these receptor / hour combinations from the NO_x emission sources associated with the MS Silicon facility.*

8. Impacts to Soils and Vegetation

Given the modeled NAAQS violations for the 1-hour SO2 and NO2, the statement in Section 4.2 that the maximum predicted NO2 ambient concentrations are below the ambient air quality standards is unsupported. The results of the NAAQS compliance modeling (i.e.,

cumulative impacts) should be used for comparison to the target values in Tables 4-1. Please provide the technical basis for assessment of soils and vegetation impacts.

MDEQ Response: *The statement provided in Section 4.2 states that the proposed MS Silicon plant will have no adverse impact on vegetation and soils. This statement was supported by conducting evaluations as recommended by USEPA in its screening procedure document for determining the impact of air pollution sources on plants, soils and animals. As discussed in Section 4.2 of Addendum #2, following these procedures the resulting predicted concentrations from emissions of regulated air pollutants from the MS Silicon facility are below the NAAQS, which are intended to protect human health and welfare (i.e., soils and vegetation) and are also well below the minimum vegetation sensitivity levels presented in the guidance document prepared by USEPA. In fact, predicted concentrations from the MS Silicon plant are less than 30% of the lowest sensitivity concentration established by USEPA as listed in Table 4-1.*

As discussed in response #6 above, the cumulative impact analysis for emissions of NO_x to demonstrate compliance with the NO_2 1-hour NAAQS did show predicted NO_2 concentration above this standard. As shown in Table 3-7a of Addendum #2, the predicted NO_2 1-hour impact based on modeling emissions from the MS Silicon facility and other existing sources in the area was 1159.86 ug/m^3. This includes the contribution from the MS Silicon and existing emission sources modeled and a conservative NO_2 background concentration. As shown in Table 4-1 the vegetation sensitivity concentration at the lowest sensitive concentration is 3,760 ug/m^3 for a 4-hour period. The maximum 1-hour concentration noted above (the actual predicted 4-hour concentration would be less than this value) is well below the sensitive concentration threshold of 3,760 ug/m3. Subsequently, emissions of NO_x from the MS Silicon facility and other existing sources should not have an adverse impact to vegetation.

As shown in Table 3-6 of Addendum #2, cumulative SO_2 impacts based on using permit allowable SO_2 emission rates for the TVA Colbert power plant showed predicted concentrations including a representative background to be 1378.26 ug/m3, which is slightly above the vegetation sensitivity sensitive threshold of 917 ug/m^3 for a 1-hour period. However, as discussed above the TVA Colbert plant has taken extensive measures to reduce is SO_2 emissions from this plant. Historical actual SO_2 emissions from this plant have been decreasing significantly. Taking into account these SO_2 reduction measures, the cumulative impact analysis resulted in combined impacts of SO_2 for a 1-hour period being 137.99 ug/m3 (refer to Table 3-6b of Addendum #2). These cumulative SO_2 impacts are below the 1-hour NAAQS of 188 ug/m3 which are intended to protect human health and welfare, as well as the vegetation sensitive threshold of 917 ug/m3. As such, predicted SO_2 cumulative impacts are below vegetation impact threshold levels established by USEPA. Thus, the MS Silicon facility in combination with other existing SO_2 emission sources should not have an adverse impact to vegetation.

9. PSD Class II Visibility Assessment

The applicant did not include a visibility impairment assessment of the project's impact in the PSD Class II area (i.e., project's impact area). Please provide the technical basis for the conclusion that this analysis was not needed for this project.

MDEQ Response: *: The MS Silicon facility will be equipped with Best Available Control Technologies (BACT) for each source with the potential to generate emissions of particulate matter (PM), oxides of Nitrogen (NO_x) and sulfur dioxide (SO_2). This will include fabric baghouses on the plant's submerged arc furnaces to significantly reduce PM and where appropriate on the material handling operations, as well as the use of Best Management Practices (BMPs) to minimize the formation of PM from the facility's fugitive emission sources. Good operating practices will also be implemented to ensure that excessive NO_x and SO_2 emissions do not occur from the facility's submerged arc furnaces and other supporting combustion devices. During actual operation of the facility, MS Silicon will be required to implement and utilize a dust control plan and will take daily visual observations to ensure that these operations will not generating emissions of NO_x, SO_2 and PM that would be injurious to humans, animals, plants, nor property, or to be a public nuisance, or create a condition of air pollution.*

In addition, the PM emission sources associated with the MS Silicon plant are required to meet very strict opacity standard expressed as a percentage. This includes 3% opacity standard on the plant's submerged arc furnaces and 10% for all other PM generating sources associated with the plant.

The incorporation of BACT and the establishment of very strict PM opacity limits should result in no visibility impairment (i.e., atmospheric discoloration and visual range reduction (increased haze)) to the surrounding area. Because of strict emission requirements imposed upon the facilities operations, it was determined that conducting a Class II visibility impairment study was not necessary.

Finally, the Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Secondary standards have been established for the 3-hour SO_2, the Annual NO_2, the 24-hour PM_{10}, and the annual and the 24-hour $PM_{2.5}$. There are no state or federal parks or airports within the significant impact area for these regulated air pollutants and averaging periods, which has historically been the determining factor for requiring a Class II visibility analysis. Since these sensitive areas were not identified to reside within the significant impact areas for these regulated air pollutants, not further Class II visibility assessment was required.

10. PSD Class I Area Significant Impact Level (SIL) Assessment

MS Silicon's PSD Class I area (Sipsey Wilderness Area) SO2 impact assessment was greater than the SIL. A cumulative impact assessment was not performed based on the applicant's statement that it was not aware of any other significant PSD increment consuming SO2 source that would impact the Sipsey Wilderness Area. The basis for this statement was not provided. Please provide the steps taken to identify other significant PSD increment consuming SO2

sources that could impact the Sipsey Wilderness Area. If sources are indeed identified, please provide a cumulative impact assessment or the technical basis for why an assessment is not needed.

MDEQ Response: *Included in Appendix C of Addendum #2 is the analysis that was performed by MS Silicon to determine the impacts of the MS Silicon facility emissions of SO_2, NO_X and PM on the Class I Sipsey Wilderness Area. As shown in Table E-1 of Appendix C, the maximum modeled SO_2 concentrations, based on using USEPA's CALPUFF model, from the MS Silicon facilities SO_2 emission sources were as follows:*

- *3-hour averaging period – High First Highest concentrations for calendar years 2001, 2002 and 2003 were 0.8775 ug/m^3, 0.5986 ug/m^3 and 1.2454 ug/m^3, respectively; and*
- *24-hour averaging period – High First Highest concentrations for calendar years 2001, 2002 and 2003 were 0.2371 ug/m^3, 0.1958 ug/m^3 and 0.2551 ug/m^3, respectively.*

Also, for consideration, the Alabama Department of Environmental Management (ADEM) has performed an assessment of the SO_2 increment impacts at the Sipsey Wilderness area. This assessment was presented at the 2010 EPA Regional/State/Local Dispersion Modelers Workshop and can be found at ***http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/archive/2010/agenda.htm****. The analysis suggest that 57% of the 3-hour SO_2 increment, 43% of the 24-hour SO_2 increment and 0% of the annual SO_2 increment has been consumed at the Sipsey Wilderness area considering potential emissions of consuming sources ad not considering any reduction in emissions which would expand increment.*

Significant impact levels for Class 1 Areas were contained in the proposed changes to the PSD and NSR of July 23, 1996. These levels were never finalized. In the EPA memorandum, "Class I Area Significant Impact Levels", dated September 10, 1991, EPA concurred with levels proposed by the Virginia Department of Air Pollution Control. The MS Silicon modeled results are summarized below along with the proposed SILs. The modeled results were slightly over both proposed significance levels for the 3-hour averaging period. The proposed significance level is approximately 4% of the PSD Class 1 increment. Given the modeling conducted by ADEM, the addition of the impacts from the MS Silicon project will not threaten the PSD increment.

Year of Data Modeled	Averaging Period	Modeled Impact	EPA Proposed SIL July 23, 1996	EPA Concurrence of SIL, September 10, 1991
2001	3-hr	0.877	1.0	1.23
	24-hr	0.237	0.2	0.275
	Annual	0.007	0.1	0.1
2002	3-hr	0.598	1.0	1.23
	24-hr	0.196	0.2	0.275
	Annual	0.008	0.1	0.1
2003	3-hr	1.245	1.0	1.23
	24-hr	0.255	0.2	0.275
	Annual	0.010	0.1	0.1

Consequently, no adverse impact at the Class I areas are anticipated.

If you have any question or require additional information, please contact me at (601) 961-5073.

Sincerely,

Harry M. Wilson III, P.E., DEE, Chief
Environmental Permits Division
Mississippi Department of Environmental Quality

Cc: Maya Rao, Director, MDEQ/Air Division
Kathleen Lusky, USEPA/Region 4/Air, Pesticides, & Toxics/Permitting

Email 06/03/15 to Stan Krivo

Ms. Beverly H. Banister, Director
Air, Pesticides and Toxics Management Division
U.S. EPA, Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street
Atlanta, GA 30303-8960

Re: Mississippi Silicon
MDEQ September 4, 2014 Response to EPA Region 4 Comments

Dear Ms. Banister,

In a May 22, 2015, telephone call will Stan Krivo, Stan noted that there were a few remaining issues with our September 4th response to EPA Region 4 comments. Although non-major, if not addresses would be considered unresolved. MDEQ response to the remaining issues is attached.

If you have any questions, please do not hesitate to call.

Thanks, Jacqueline Evans

Jacqueline Evans
Environmental Permits Division - Modeling Branch
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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ATLANTA FEDERAL CENTER
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November 21, 2013

Mr. Harry M. Wilson, III, P.E., Chief
Environmental Permits Division
Office of Pollution Control
Mississippi Department of Environmental Quality
P.O. Box 2261
Jackson, Mississippi 39225

Dear Mr. Wilson:

Thank you for sending the Prevention of Significant Deterioration (PSD) preliminary determination from Mississippi Silicon LLC (MS Silicon), dated October 21, 2013, which is proposing to construct a new greenfield silicon manufacturing plant in Tishomingo County, MS. The manufacturing plant will utilize four (4) semi-enclosed submerged electric arc furnaces (EAF) with a capacity of 2.75 tons/hr each to produce approximately 84,096 tons/year of 98-99% pure silicon metal. Based on potential emissions of regulated air pollutants from the proposed silicon manufacturing plant, the plant will be considered a New Major Stationary Source under the PSD regulations for emissions of Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Particulate Matter (PM_{10}/$PM_{2.5}$), Volatile Organic Compounds (VOCs), and Greenhouse gases (GHGs).

The original PSD permit application (dated August 15, 2013) only contained air quality impact modeling of the project emissions for significant impact level (SIL) assessment (*i.e.,* screening modeling). Since an impact analysis to PSD Class I Areas was not provided, and the project screening modeling had concentrations greater than the SIL, subsequent modeling documents were prepared to address these required analyses including Class I Impacts for Sipsey and Mingo Areas and Addendum #1 Multi-Source Air Quality Impact Evaluation.

This correspondence supplements our written comments to the Mississippi Department of Environmental Quality (MDEQ) sent on November 14, 2013, and specifically address the Air Quality analysis. These comments also supplement earlier comments and requests for information provided to MDEQ via email on September 10, 2013, which presently have not been fully addressed by the latest PSD Class I impact assessment and the PSD Class II multi-source compliance modeling. In addition, the comments provided below were discussed with MDEQ during a conference call with the EPA held on November 15, 2013. These comments are:

1. Contrary modeling information that affects the impact assessments has not been resolved (*e.g.,* significant impact areas are indicated to be contained within Tishomingo County while MDEQ's Preliminary Determination indicates otherwise).

2. The project impacts to the Sipsey Wilderness PSD Class I area are greater than the SO_2 SIL. These significant impacts generally indicate the need to perform a cumulative PSD Class I area increment assessment or a sufficient demonstration why the cumulative PSD Class I area increment assessment is not needed. This should be reconciled in the permit record before a permit is issued.

3. The PSD Class II area National Ambient Air Quality Standards (NAAQS) compliance modeling and documentation does not provide sufficient information and analyses to support the statement that the project will not cause or contribute to the modeled NAAQS exceedence.

4. The PSD Class II area PSD increment compliance modeling and documentation also does not provide sufficient information and analyses to support the statement that the project will not cause or contribute to a PSD increment exceedence.

Thank you for the opportunity to review and provide comments on these documents. If you have any questions about these comments or require additional information or clarification, please do not hesitate to contact Stan Krivo at (404) 562-9123 or myself at (404) 562-9185.

Sincerely,

Heather M. Ceron

Heather M. Ceron
Chief
Air Permits Section

MUSGROVE SMITH LAW

RECEIVED
OCT 28 2014
RA's Office

October 24, 2014

VIA U.S. CERTIFIED MAIL, RETURN-RECEIPT REQUESTED

David Tuten
Mississippi Silicon, LLC
313 Lawton Road
Marietta, OH 45750

Re: **Notice of Intent to File Citizen Suit Pursuant to 42 U.S.C. § 7604(a)(1)**

Dear Mr. Tuten:

This letter shall serve as notice that 16 Front Street LLC ("16 Front Street") and C. Richard Cotton ("Cotton") intend to file a citizen suit against Mississippi Silicon, LLC ("MS Silicon") pursuant to Section 304(a)(1) of the Clean Air Act, 42 U.S.C. § 7604(a)(1).

On about November 27, 2013, the Mississippi Department of Environmental Quality ("MDEQ") issued Permit No. 2640-00060 (the "Permit"), which purportedly authorizes MS Silicon to construct a silicon metal manufacturing facility (the "Plant") in Burnsville, Tishomingo County, Mississippi. Construction of the Plant is ongoing.

Based on the amount of coal the furnaces will consume, the Plant is a new major source of hazardous air pollutants ("HAPs") -- in particular hydrogen chloride and hydrogen fluoride -- under Section 112 of the Clean Air Act, 42 U.S.C. § 7412.

I. Violation of 42 U.S.C. § 7412(g)(2) and 40 C.F.R. § 63.43(b)

The Clean Air Act prohibits construction of a new major source of HAPs unless the Administrator (or State) has determined that HAP emissions will be controlled by the maximum achievable control technology ("MACT"). *See* 42 U.S.C. § 7412(g)(2). When there is no national emission standard for HAPs ("NESHAP") that applies to a particular emission, a pre-construction MACT determination must be made on a case-by-case basis. *See* 42 U.S.C. § 7412(g)(2)(B). If the state has an approved title V program that does not require the owner or operator of a new major source of HAPs to obtain a title V permit before construction -- which is the case in Mississippi -- the owner or operator shall either obtain a Notice of MACT Approval or apply for a MACT determination prior to commencing construction. *See* 40 C.F.R. § 63.43(b).

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- Based on the amount of coal the submerged arc furnaces MS Silicon is constructing will consume, the furnaces -- and the Plant -- will be major sources of HAPs, including without limitation hydrogen chloride and hydrogen fluoride. There is no NESHAP that applies to HAP emissions from the furnaces. MS Silicon did not apply for or receive a Notice of MACT Approval or MACT determination for the furnaces prior to commencing construction of the Plant. The Permit does not include an MACT determination for the furnaces. MS Silicon commenced construction of the Plant on about January 13, 2014 and is continuing to construct the Plant in violation of 42 U.S.C. § 7412(g)(2), 40 C.F.R. § 63.43(b), and Miss. Admin. Code § 11-2-8.1.

II. Petitioners

16 Front Street's address is 1209 Orange St., Wilmington, DE 19801.

Cotton's address is 243 County Road 783, Saltillo, Mississippi 38866.

16 Front Street and Front Street may be contacted through their attorneys, who may be reached at:

Ronnie Musgrove
MUSGROVE/SMITH LAW
1635 Lelia Drive, Suite 104
Jackson, MS 39216
(601) 852-1696

I appreciate your attention to this matter, and feel free to contact me if you wish to discuss it.

Sincerely,

MUSGROVE/SMITH LAW, PLLC

Ronnie Musgrove

cc: Mississippi Silicon, LLC
c/o CT Corporation System
645 Lakeland East Drive, Ste. 101
Flowood, MS 39232

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Application for Prevention of Significant Deterioration (PSD) Air Permit

15 August 2013

MISSISSIPPI
SILICON

Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Approximately One-Half Mile East of the Intersection of County Roads 210 and 365
Burnsville, MS 38833

K/J Project No. 1341008*00

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Section 1: Introduction

Mississippi Silicon, LLC. (MS Silicon) is proposing the construction of a silicon manufacturing plant located near the city of Burnsville, in Tishomingo County, Mississippi (Figure 1-1). The silicon manufacturing plant is being constructed to produce revolutionary low-cost, high-quality silicon allowing MS Silicon to meet the ever-increasing demand for its silicon. The new facility will enable MS Silicon to produce silicon metal so it can be sold to the company's existing and new customers in the global market.

Several factors were important influences on this choice of site:

- Burnsville is centrally located to both the raw material suppliers and finished product customers for Mississippi Silicon.
- The site is located on the Tennessee-Tombigbee Waterway, with a barge loading and unloading facility immediately adjacent and available for Mississippi Silicon to use for inbound materials and outbound product, if desired. The Tennessee- Tombigbee Waterway provides direct access to both the Gulf of Mexico and the Ohio River.
- A high-voltage TVA line runs past the western boundary of the site. TVA will be a stable, reliable, low-cost long-term supplier of the most important production input for Mississippi Silicon, electricity. The proximity of this power line will minimize the cost and facilitate the link to this input.
- Mississippi has a large and sustainable supply of wood, an important raw material in Mississippi Silicon's production process.
- The state of Mississippi, Tishomingo County, and the TVA enthusiastically support the project, and are providing significant financial incentives to demonstrate that support.

The plant will provide jobs for nearly 150 people. When operational, MS Silicon's Mississippi facility has the potential to catalyze significant economic development for Tishomingo County and the state. The project will also create an estimated 500 construction jobs during the peak period of its construction.

The silicon manufacturing plant being proposed by MS Silicon will be capable of producing a high quality, low cost silicon. The manufacturing plant will utilize four (4) semi-enclosed submerged arc furnaces (SAF) with a capacity of 2.75 tons/hr each (~45 MVA) to produce approximately 84,096 tons/year of 98-99% pure silicon metal. The plant will incorporate into its design proven and highly efficient control technologies and techniques for the reduction of potential emissions of regulated air pollutants. In order to create the silicon metal, quartz, coal, and wood will be processed in the SAF.

The silicon manufacturing plant will involve specific process areas including raw material receiving, handling and storage operations along with operations associated with the actual silicon manufacturing process. The primary process operations associated with silicon manufacturing will include:

- Raw material handling, storage and conveyance (coal, wood, quartz and limestone);

- Loading of these raw materials into four (4) semi-enclosed submerged arc furnaces (SAF) (electric fired) to produce liquid silicon metal (approximately 98% pure); and
- Using ladles and casting molds to produce solid silicon metal (approximately 98% pure).

The process areas that will have the potential to emit regulated air pollutants include:

- Material handling and transfer to and from coal, wood and quartz storage piles;
- Storage yard for coal, wood and quartz storage piles;
- Raw material day bins to support the semi-enclosed submerged arc furnaces;
- Four (4) semi-enclosed submerged arc furnaces (SAF) with four (4) baghouses; and
- Four (4) natural gas-fired ladle pre-heaters.

The following plantwide operations and activities will have the potential to emit regulated air pollutants:

- Tank farm;
- Fugitive emissions from roadways;
- Slag handling;
- Silica fume silos:
- Facility-wide miscellaneous operations; and
- Emergency generator.

The operations identified above reflect a phased construction. Phase I will involve the installation of two (2) SAFs and supporting operations. At the completion of Phase I, MS Silicon will initiate construction of Phase II which will involve the installation of two (2) additional SAFs and supporting operations.

Collectively, these process areas will have the potential to emit major levels of regulated air pollutants and, therefore, will be subject to the Prevention of Significant Deterioration (PSD) regulations of the United States Environmental Protection Agency (USEPA) along with the requirements of the Mississippi Department of Environmental Quality (MDEQ) Air Pollution Code (APC), which contain air quality requirements that must be satisfied prior to construction of this type of plant. Appropriate air pollutant emission controls/techniques to minimize potential emissions of regulated air pollutants, appropriate measurements, testing and recording of operational parameters will be performed to confirm that the plant's major source levels of regulated air pollutant emissions are being achieved. The regulatory requirements imposed by the PSD and MDEQ air regulations, as well as emissions controls/measurements and compliance testing will ensure that the proposed silicon manufacturing plant will have no adverse impact to human health and welfare.

1.1 Summary of the Proposed Silicon Manufacturing Project

The proposed project will involve the construction and operation of a silicon manufacturing plant to be located in Tishomingo County, near the town of Burnsville. The proposed silicon manufacturing plant will be constructed in two (2) phases. After completion of both phases, the manufacturing plant will utilize four (4) semi-enclosed submerged arc furnaces (SAF) with a capacity of 2.75 tons/hr each (~45 MVA) to produce approximately 84,096 tons/year of 98-99% pure silicon metal. The proposed project will have the potential to emit regulated air pollutants in sufficient quantities (i.e., tons/year) to trigger the PSD regulations. Potential emission of regulated air pollutants at the conclusion of Phase II are summarized below:

Regulated Air Pollutant	Potential to Emit Emission Rate (tons per year)
Sulfur Dioxide (SO_2)	2,170.1
Nitrogen Dioxide (NO_2)	1,906.2
Carbon Monoxide (CO)	1,444.3
Particulate Matter (PM)	104.1
Particulate Matter (<10 microns) (PM_{10})	81.6
Particulate Matter (<2.5 microns) ($PM_{2.5}$)	73.1
Volatile Organic Compounds (VOC)	93.5
Lead (Pb)	< 1.0
Regulated HAPs	9.9 (individual), 13.9 (total)
Greenhouse Gases (CO_2e)	402,396.76

Based on the proposed plant's potential emission rates defined above, the proposed silicon manufacturing plant will have the potential to emit regulated air pollutants in excess of 100/250 tons/year and will be considered a Major Stationary Source. Since Tishomingo County is considered attainment for all regulated criteria air pollutants, PSD review was triggered for emissions of SO_2, NO_2, CO, PM_{10}, $PM_{2.5}$, VOCs, and GHGs from the proposed silicon manufacturing plant. The proposed silicon manufacturing plant will be considered Major under the PSD program, as well as under the Title V Operating Permit Program. The proposed silicon manufacturing plant will be considered a minor stationary source of regulated HAP emissions as defined under EPA's Title III program.

As part of the project, the potential air pollutant emission sources associated with the proposed silicon manufacturing plant will implement Best Available Control Technology (BACT) and as a result will not have an adverse impact on human health and welfare. Sections of this application provide the results of the air quality demonstration showing the plant will have no adverse impact on human health and welfare. The proposed silicon manufacturing plant will be implementing the following BACT control measures:

- A baghouse will be installed to control particulate matter on the plant's Submerged Arc Furnaces (SAF) to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions. One baghouse will be installed for each individual SAF;

- A baghouse(s) will be installed to control particulate matter from raw material handling to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions;
- A baghouse(s) will be installed to control particulate matter from product handling to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions;
- Utilization of natural gas as the primary combustion fuel in the ladle pre-heaters associated with the proposed plant. This is the cleanest burning fossil fuel and inherently reduces emissions of regulated air pollutants when compared to other fossil fuels such as coal and oil;
- Implementation of a Fugitive Dust Control Plan to minimize potential emissions of $PM/PM_{10}/PM_{2.5}$ from becoming airborne from various support operations associated with the plant (i.e., slag handling, raw material handling, paved and unpaved roadways);
- Installation of low NO_x burner technology or design on the plant's natural gas combustion devices to reduce potential emission of oxides of nitrogen (NO_x);
- Inclusion of bin vent filters on silica fume silos to reduce potential $PM/PM_{10}/PM_{2.5}$ emissions;
- Energy efficiency techniques to reduce the plant's overall potential for formation of greenhouse gas emissions (GHG);
- Implementation of testing, monitoring, recordkeeping and reporting requirements to ensure the plant will operate in compliance with applicable regulatory requirements and will not cause or contribute significantly to an exceedance of air quality standards developed by EPA to protect human health and welfare.

1.2 Site Information

The proposed silicon manufacturing plant will be located near the town of Burnsville in Tishomingo County, MS. Figure 1-1 shows a county map of Mississippi including the location of the proposed site in Tishomingo County. Figure 1-2 identifies the location of the proposed plant in relationship to Burnsville, MS while Figure 1-3 depicts an aerial view of the proposed plant location. Refer to Figure 2-1 for a general process area layout.

This site was selected based on a variety of factors including existing infrastructures, as well as new infrastructures being constructed in the vicinity of the site. Some of these critical infrastructures are listed below:

- Existing electrical transmission lines;
- Existing natural gas;
- Close proximity to major roadways to allow supply trucks easy access into and out of the proposed plant site;
- Rural location; and

- Located away from sensitive receptors such as hospitals, schools, nursing homes, and highly populated residential areas.

1.3 Anticipated Construction Schedule

The proposed plant will be constructed in two phases, Phase I and Phase II. Provided below is a tentative schedule related to construction and operation of these phases:

- Initiate construction of Phase I – November 2013;
- Complete construction of Phase I and commence operation – November 2015;
- Initial construction of Phase II – Spring 2015; and
- Complete construction of Phase II and commence operation – Spring 2017.

1.4 Maximum Design Silicon Production Rates

The proposed plant will have the following maximum design short term and long term production rates for silicon:

- Short Term (tons/hour)
  - Maximum Hourly Rate – One (1) SAF – 2.75 tons/hour
  - Maximum Hourly Rate – Four (4) SAFs – 11 tons/hour
  - Typical or Average Rate – One (1) SAF – 2.4 tons/hour
  - Typical or Average Rate – Four (4) SAFs – 9.6 tons/hour
- Long Term (tons/year)
  - Maximum Annual Rate – One (1) SAF – 21,024 tons/year
  - Maximum Annual Rate – Four (4) SAFs – 84,096 tons/year.

1.5 Regulatory Drivers – Permission to Construct the Plant

As discussed above, the proposed silicon manufacturing plant will have the potential to emit PSD major levels of regulated air pollutants. New equipment and operations which emit air pollutants within the MDEQ jurisdiction are subject to pre-construction review and approval by MDEQ pursuant to the APC-S-2 Permit Regulation for the Construction and/or Operation of Air Emissions Equipment.

The proposed plant will also be subject to other requirements contained within MDEQ's air quality regulations as well as EPA's federal air quality regulations (i.e., New Source Performance Standards (NSPS) and Maximum Achievable Control Technology (MACT). These regulations impose specific requirements and standards for stationary sources of air pollutants. Detailed discussions of these regulations as they pertain to the air pollutant sources at the proposed plant are provided in Section 3.

According to MDEQ APC-S-2-1-D, "Permitting Requirements", any new stationary source or modification of a stationary source must have a permit to construct or multi-media permit incorporating such permit before beginning construction.

The construction application (as specified in the MDEQ application instructions and MDEQ regulations) must include the data and information necessary to demonstrate that the proposed project, which includes new sources of air pollution, complies with applicable air quality regulations and standards.

1.6 Application Requirements – Construction Application and Instructions

The construction application should include and identify the following:

- **GENERAL FORM** – Includes name, address and contact for the owner/applicant and the facility. Also includes the SIC code, number of employees, principal processes, principal products and raw materials, and operating schedule. This form also requires the signature of a registered official.

  Refer to Appendix A which includes the completed MDEQ application forms.

- **All operations or equipment having air emissions**. Specify the maximum schedule, maximum operating rate and expected operating rate, if different from the maximum.

  Refer to Section 2 of this application which identifies operations/equipment having the potential to emit regulated air pollutants, including supporting calculations and documentation.

- **Emission Rates** (in units of applicable emission standard as well as pounds per year and tons per year for each pollutant subject to regulations that can be reasonably expected to be emitted from each emission point. Emission rate calculations must be provided. The following emission rates shall be provided in the Emissions Summary Section of the form:

  - Potential uncontrolled emissions; and
  - Proposed emission rate (maximum emission rate).

  Refer to Section 2 of this application which identifies operations/equipment having the potential to emit regulated air pollutants, including supporting calculations and documentation.

- **Exhaust or Stack Parameters** for each emission source (height, velocity, diameter, and temperature) should be provided in the Emissions Summary Section of the form.

Refer to Section 2 of this application which identifies operations/equipment having the potential to emit regulated air pollutants, including supporting calculations and documentation.

The following additional information must be submitted in duplicate:

- **Design Calculations and Specifications** including all data and calculations used in selecting or designing process and control equipment;
- **Site Drawings** must be to scale and show at least the following:
  - Property involved with dimensions, clearly defining restricted entry boundaries, and if different, total property boundaries;
  - Location and identification of all existing and/or proposed buildings, structures, and/or equipment, including points of discharge of air contaminants to the atmosphere, drawn to scale and in proper orientation;
  - Dimensions (length, width) of all buildings, structures, and/or equipment, including emission points;
  - Elevation of all buildings, structures, and/or equipment, including emission points, showing heights, grade baseline, and grade baseline height above mean sea level;
  - Primary compass direction indicator; and
  - Location of streets and all adjacent properties. Show location of all buildings outside the property that are within 150 feet of the equipment involved in the application. Identify all such buildings, specifying number of stories, or approximate height, and indicate the prevailing wind direction.

  Refer to Sections 1 and 2 of this application for site drawings related to the proposed plant.

- **Construction Drawings** should be an assembly drawing, dimensioned and to scale, in as many sections as needed to show clearly the design and operation of the equipment and the means by which air contaminants are controlled. The following must be shown:
  - Size and shape of equipment. Show exterior and interior dimensions and features; and
  - Locations, sizes, and shape details of all features which may affect the production, collection, conveying or control of air contaminants of any kind: location, size and shape details concerning all materials handling equipment.

- **Description of Process and Control Equipment** – Include a written description of each process at the facility and the function of the equipment used in the process. Descriptions must be complete and particular attention must be given to explaining all stages in the process where the discharge of any materials might contribute in any way to air pollution. Control procedures must be described in sufficient detail to show extent of control of air contaminants anticipated in the design, specifying the expected efficiencies of the captures systems and control devices. All obtainable data must be supplied concerning the nature, volume, particle size, weights, chemical composition and concentrations of all types of air contaminants; and

- **Block Flow Diagram** – Include a drawing showing the steps of the process and the flow of materials through the process and any control devices.

- Additional information may be required as necessary to evaluate the design adequacy of the facility or to comply with PSD regulations.

  Refer to Section 2 of this application for process related information and diagrams related to the proposed plant.

The following sections are also required for a PSD application:

- **Applicable Requirements** - Provide compliance evaluations for all applicable state, federal and local air pollution control requirements including applicable requirements in MDEQ Regulations, federal new source performance standards, and national hazardous air pollutant standards. **(Refer to Section 3).**

- **BACT** - Provide a demonstration that proposed air pollution control devices and measures comply with Best Available Control Technology (BACT) requirements. **(Refer to Section 4).**

- **Air Quality Impacts Analysis** - Provide an ambient air quality impacts analysis based on modeling facility emissions using EPA approved air dispersion models. The modeling analysis should conform to current EPA modeling guidelines and recommended methods. **(Refer to Section 5).**

- **PSD Threshold Determination** - Provide a PSD threshold determination. **(Refer to Section 3).**

- **Additional Impact Analysis** – Provide an additional impact analysis.

  Refer to Sections 2 through 6 of this application for the design calculations/specifications and appropriate impact analysis.

MS Silicon, based on discussions held during the pre-application meeting with MDEQ and the application requirements listed above, is not aware of any additional information that is required for this application to be deemed complete.

The information required, as listed above, is provided in this construction permit application. It is MS Silicon's understanding that applications containing the required information should satisfy MDEQ's requirements for a complete application.

MS Silicon is confident that it has designed the proposed silicon manufacturing plant such that emissions from the facility will meet the requirements of MDEQ standards and rules, as well as the requirements defined by USEPA. Sufficient information is included in this application to provide MDEQ with reasonable assurance that the standards and rules will be met.

1.7 Application Review Timeline

It is our understanding that upon submission of this application, the MDEQ will conduct a complete and thorough review of its contents to ensure that the plant and its associated air emissions sources will:

- Meet all applicable state and federal air quality regulations and requirements;
- Not cause an adverse impact to human health and welfare; and
- Will employ best available control technologies (BACT) and implement appropriate testing, monitoring, recordkeeping and reporting that will ensure future minimal impacts to human health and welfare.

Upon completing this review, a construction permit will be proposed by the MDEQ (containing specific emission limitations, testing, monitoring, recordkeeping, and reporting requirements) and will be provided to the public including EPA Region IV for review and comment, prior to final issuance. The permit to be issued will allow for construction and limited operation. An operating permit will have to be obtained upon final construction of the plant.

1.8 Request for Construction Permit Issuance

MS Silicon is hereby requesting that MDEQ issue a construction permit to allow for construction of the regulated air pollutant emitting units associated with a stationary source (i.e., the proposed plant). It is MS Silicon's understanding that as defined in MDEQ APC-S-2-1-C-27 "stationary source" is defined as:

"Any building, structure, facility, or installation which emits or may emit regulated air pollutant(s)."

MS Silicon understands based on the definition of "stationary source" contained in APC-S-2 that it is not allowed to perform any construction, installation, or establishment of any stationary source without an approved construction permit.

Upon the completion of construction or installation of an approved stationary source or modification, MS Silicon will notify the MDEQ that construction or installation was performed in accordance with the approved plans and specifications on file with the MDEQ.

The following individual will be the primary contact for answering any questions MDEQ may have related to the application request for construction:

Contact Name: Mr. Steven Frey

Phone Number: 847-278-7705

Email: stevefrey@kennedyjenks.com

It is anticipated that MS Silicon will initiate construction of the project in the November of 2013 and begin operation within 20 to 24 months of commencing construction. MS Silicon hereby agrees as part of the construction issuance process to meet the design criteria as accepted by MDEQ and to abide by the MDEQ rules regarding the quantities and types of materials to be discharged from the installation of the proposed silicon manufacturing plant

1.9 MDEQ Requirements for Public Involvement

It is MS Silicon's understanding that the public will be given an opportunity to express their interest in the construction permit application prior to approval by MDEQ. A brief summary of the involvement is provided below, reflecting MS Silicon's understanding of the public notice requirements. If this understanding is incorrect, MS Silicon is requesting that MDEQ provide appropriate guidance:

- Availability for public inspection in at least one location in the area affected of the information submitted by the owner or operator and of MDEQ's analysis of the effect on air quality;

- A 30-day period for submittal of public comment; and

- A notice, by prominent advertisement in the area affected, of the location of the source information and analysis.

A copy of the notice will be sent to the Administrator of EPA through Region IV, and to all other state and local air pollution control agencies having jurisdiction in the region in which such new or modified installation will be located. A permit to construct issued pursuant to this paragraph is federally enforceable.

1.10 Contents of This Application Request

To assist the MDEQ in approval and issuance of a construction permit, the following information is provided in this application request:

- **Section 2: Description of Proposed Plant** - This section contains a description of the process equipment, a description of control technologies and methods to be used, a description of the methods used to estimate the potential emissions of regulated air pollutants, and tables summarizing the estimated potential to emit (PTE) regulated air pollutant emission rates;
- **Section 3: Regulatory Applicability** - This section discusses the pertinent federal, state, and local air pollution control regulations that may be applicable to the proposed plant. This section also provides a PSD threshold determination;

- **Section 4: BACT Analysis** – This section presents a demonstration that the proposed air pollution control devices and measures comply with Best Available Control Technology (BACT) requirements;
- **Section 5: Air Quality Impact Evaluation** – An air quality impact evaluation was performed to demonstrate that predicted ambient air concentration impacts resulting from emissions of regulated air pollutants from the proposed plant would not adversely impact human health and welfare. These predicted impacts were determined from EPA's approved air dispersion model, referred to as AERMOD;
- **Section 6: Additional Impact Analysis** - This section provides a discussion on the additional impacts that might be caused by the proposed plant including soil and vegetation, endangered species, Class I areas, etc.;
- **Section 7: Suggested Permit Structure** – This section presents suggested permit language;
- **Section 8: Application Forms** – This section provides a list of the application forms required by MDEQ;
- **Appendix A: MDEQ Application Forms** – Appendix A includes the appropriate MDEQ application forms required for a construction permit; and
- **Appendix B**: **Air Quality Impact Evaluation Modeling Results** – Appendix B contains copies of the output files obtained from the air dispersion model "AERMOD", which was used to perform the air quality impact modeling.

Section 2: Description of Proposed Plant

MS Silicon is proposing the construction of a silicon manufacturing plant in Tishomingo County, Mississippi. The plant will consist of two (2) specific process areas:

- Silicon manufacturing; and
- Support operations.

The silicon manufacturing process will involve the mixing of quartz, coal, and wood in a semi-enclosed submerged arc furnace to produce 98% pure silicon. Further processing is performed to produce the 98% pure silicon in the form of an ingot or flake.

The silicon manufacturing process will include the following operations with the potential to emit regulated air pollutants:

- Material handling and transfer to and from coal, wood and quartz storage piles;
- Storage yard for coal, wood and quartz storage piles;
- Wind erosion from coal, wood and quartz storage piles;
- Wood chipper (electric-fired);
- Casting frames;
- Raw material day bins with supporting baghouse(s);
- Four (4) semi-enclosed submerged arc furnaces (SAF) with four (4) baghouses;
- Four (4) ladle pre-heaters; and
- Product refining operations with supporting baghouse(s).

The following plantwide operations and activities will support the entire plant and will also have the potential to emit regulated air pollutants:

- Tank farm;
- Fugitive emissions from roadways;
- Slag handling;
- Silica fume silos:
- Facility-wide miscellaneous operations; and
- Emergency generator.

To provide a visual representation of the plant, several figures are contained in this application. The figures provided are as follows:

- Figure 1-1 provides a county map of the state of Mississippi and the location on the proposed plant
- Figure 1-2 provides the proposed site location in relation to Burnsville, MS;
- Figure 1-3 provides an aerial view of the proposed plant location.

Collectively, the process areas noted above will have the potential to emit major levels of regulated air pollutants and will be subject to the PSD air regulations along with air regulations established by the Mississippi Department of Environmental Quality (MDEQ). Proven and highly efficient air pollutant emission control technologies and techniques will be utilized to minimize potential air emissions from the air emission units associated with the proposed plant. Continuous emission measuring, stack testing, as well as recording of operational parameters will also be performed, as appropriate; to confirm the plant's levels of regulated air pollutant emissions. These emissions will result in the plant having no adverse impacts to human health and welfare.

To support the conclusion that no adverse impacts will occur to human health and welfare, MS Silicon has conducted an air quality impact evaluation for potential emissions of regulated air pollutants from the plant. The results of that evaluation, including a demonstration of compliance with the state and National Ambient Air Quality Standards is included in Section 5 of this PSD construction permit application.

The general layout of the silicon manufacturing process is provided in Figure 2-1. A general process flow diagram of the silicon manufacturing process is presented in Figure 2-2 and process descriptions and definitions are provided in Figure 2-2a. A generic process flow summary of the silicon manufacturing process is provided in Figure 2-2b and representative pictures depicting the silicon manufacturing process are shown in Figure 2-2c. Process flow diagrams depicting other processes and equipment associated with the silicon manufacturing plant are provided in Figures 2-3 through 2-9.

This section contains a discussion of the process equipment, a description of the air pollution control technologies / management practices to be used, the methods used to estimate the potential emissions of regulated air pollutants, and tables summarizing the estimates of these regulated air pollutant emission rates. Tables 2-1 and 2-1a identify the initial list of equipment with the potential to emit regulated air pollutants, including stack information. Summaries of project related estimated PTE of regulated air pollutants including criteria air pollutants, hazardous air pollutants (HAPs) and greenhouse gases (GHG) are provided in Tables 2-9, 2-10 and 2-11, respectively. As shown in these tables, the proposed plant is classified as a major stationary source of regulated air pollutants as defined under state and federal air regulations.

To support the emission estimation process, methodologies involving engineering estimates, vendor suggested emission rates and prior experience were utilized to conservatively estimate PTE regulated air pollutants from the proposed silicon manufacturing plant. As part of the emission estimation process, MS Silicon utilized the best available information/data to determine air pollutant emission levels for each of the four SAFs. Emission estimates for the raw material receiving, handling and storage operations, and

emergency support equipment were based on either a) USEPA established emission factors and methodologies; b) vendor estimates; or c) state/federal emission standards.

For purposes of this application, any reference to particulate matter (PM) also includes particulate matter with an aerodynamic diameter less than or equal to a nominal ten (10) micrometers (PM_{10}) and particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$).

Provided below is a discussion on each process area to be performed within the silicon manufacturing process. To assist MDEQ in their development of the plant's construction permit, we have also included emission identification numbers following the numbering scheme typically employed by the MDEQ in their construction and operating permits.

2.1 Silicon Manufacturing Process – AA-100, AA-200 and AA-300

The proposed silicon manufacturing process will utilize four semi-enclosed submerged arc furnaces (SAF) that will convert raw materials including coal, woodchips and quartz to 98-99% pure silicon metal. .

The three (3) primary air pollutant emission activities within the silicon manufacturing process are 1) raw material handling and storage, 2) processing of these raw materials into one of four SAFs and supporting activities to produce silicon ingots, and 3) product refinement and handling. These three (3) activities have been assigned emission ID's AA-100, AA-200, and AA-300, respectively.

2.1.1 Raw Material Handling, Storage and Transfer to/from Storage Piles – AA-101, AA-102, AA-103, AA-104, AA-105 and AA-106

Raw material handling, transferring and storage operations will begin with the receipt of raw materials via truck. Coal, woodchips, and quartz are unloaded in a designated unloading area where various mechanisms will be used to transfer these materials to the appropriate storage piles. These mechanisms will include unloading of the trucks by tilting of the truck or bottom unloading from the truck. The raw materials will be emptied onto the pile or transferred by front end loaders to the piles. From the storage piles, materials will be conveyed via front end loaders to enclosed raw material storage/day bins. From the day bins, the raw materials will be weighed and dropped to a skip bucket from which they will be transferred to the top of one (1) of four (4) semi-enclosed submerged arc furnaces for processing. Limestone will be used as flux and will be delivered in bulk. Provision will be made for its storage in the Raw Material Enclosure area. The same hopper and conveying system will be used to convey limestone to the SAF. Limestone will be fed directly via one of the charging conveyors on the upper floor.

The following emission units have been identified in the raw materials handling, storage and transfer operations process (AA-100):

- AA-101 – Material handling and transfer to and from coal storage pile with a material throughput rate of 105,120 tons/year;

- AA-102 - Material handling and transfer to and from wood storage pile with a material throughput rate of 212,763 tons/year;
- AA-102b – Wood chipper (electric-fired);
- AA-103 - Material handling and transfer to and from quartz storage pile with a material throughput rate of 212,763 tons/year;
- AA-104 – Limestone handling operations with a material throughput rate of approximately 183 tons/year;
- AA-101a, AA-102a, AA-103a, - Material Handling (Coal, Wood, and Quartz Transfer to Day Bins) Baghouse;
- AA-105 – Storage Pile Processing (Bulldozers); and
- AA-106 – Wind erosion on coal, wood and quartz storage piles.

Refer to Figure 2-3 for a process flow diagram of the raw material handling and transfer operations.

2.1.1.1 Potential Air Pollutant Emission Sources

Since the material handling operations will involve solid type materials, potential particulate matter (PM) emissions may occur from a) unloading of raw materials from the trucks; b) moving the materials by front end loaders to the pile areas/day bins; c) conveying the material to the day bins/SAFs; d) fugitive dust from vehicle traffic on the plant roads; and e) wind erosion from the raw material storage areas. It is important to note that the conveyors and conveyor transfer drop points associated with this process area will be covered to the extent physically possible. Potential PM emissions from the covered storage area will be minimal based on the moisture content of the materials, as well as any walls and/or roof that may be used to cover the primary pile, thus minimizing the exposure of the stored materials to wind. PM emissions from the storage areas and equipment to be utilized to place and remove these materials from this storage area will also be negligible due to the use of larger sized pieces of materials, high moisture content of the raw materials and low speed of the vehicles moving the materials.

Potential fugitive dust emission rates were estimated using the recommended methods developed by USEPA (i.e., AP-42). Emission source types for this process includes material handling (i.e., material drop points), paved and unpaved road (truck traffic on the paved and unpaved roads), equipment (i.e., front end loaders) utilized to maintain the storage areas, and wind erosion from the proposed outside storage area. Details of the calculations and the resulting emission estimates can be found in Tables 2-4 through 2-7d. Appropriate control efficiencies have been incorporated to reflect equipment installed to minimize exposure to wind during the actual transfer of material from one conveyor to another or dropping of the material to a storage pile.

2.1.1.2 Air Pollution Control Devices/Technologies

The raw material receiving, handling, storage, and processing system will be designed to minimize fugitive dust emissions through use of best management practices, which include covers on conveyors and, to the extent physically possible, covered chutes for dropping materials to and from conveyors (referred to as conveyor transfer points). It is important to note that specific sections of the conveyor system will be uncovered to allow for visual inspection of the materials. Dropping raw materials onto the outdoor storage areas will also be designed to minimize excessive dust. Raw material day bins, identified as emission group AA-101a, AA-102a and AA-103a, will be used to support the semi-enclosed submerged arc furnaces. The raw materials from the storage piles will be transferred to the raw material day bins using front end loaders before being loaded into the semi-enclosed submerged arc furnaces. The transfer of raw materials to the day bins will be controlled by a common baghouse or a series of smaller baghouses. All of the above techniques represent the best available control technology for minimizing PM emissions from the raw material receiving, handling, and storage operations. The raw materials to be utilized will generally be moist, larger in size than finer materials such as sand, and not prone to dusting. The composition of the materials themselves inherently reduces the potential for PM emissions.

2.1.1.3 Type of Release (Point or Fugitive)

With the exception of the transfer to coal, wood, and quartz to the day bins, all of the PM emissions associated with the raw material receiving, handling and storage operations will be fugitive in nature.

2.1.1.4 Calculation of Air Pollutant Emission Basis and Supporting Documentation

Potential fugitive PM emission rates were estimated using the recommended methods developed by EPA (i.e., AP-42). Emission source types for this process included material handling (i.e., conveyor transfer points or material drop points), paved road (truck traffic on these paved roads), equipment (i.e., front end loaders) utilized to maintain the storage areas, and wind erosion from the proposed outside storage areas. Details of the calculations and the resulting emission estimates can be found in Tables 2-4 through 2-7d.

2.1.2 Silicon Manufacturing Process (i.e., Meltshop Operations)

The silicon manufacturing process (i.e., the meltshop operations) will include melting, transferring and cooling operations. Refer to Figures 2-4 and 2-5 for process flow diagrams related to the furnaces and metal processing, respectively.

The raw material day bins, identified as emission group AA-101a, AA-102a and AA-103a, will be used to support the semi-enclosed submerged arc furnaces. The raw materials from the storage piles will be transferred to the raw material day bins before being loaded into the semi-enclosed submerged arc furnaces. Material will be mechanically (i.e., front end loaders or other types of equipment) moved to reclaim areas where the materials will be conveyed either underground or aboveground to the raw material day bins.

The raw material day bins will then feed into one or more of the four (4) SAFs. The SAFs will then convert the coal, woodchips, and quartz into 98% pure silicon metal in molten form. Each SAF will be rated at approximately 25 megawatts per hour of input and will produce a design maximum of 2.75 tons of silicon per hour. The processes associated with producing the silicon will include raw material handling and silicon metal melting and tapping. Each SAF will be equipped with a baghouse for controlling PM emissions. Appropriate equipment will be installed on each SAF that will be used to duct furnace exhaust gases to the baghouse.

These four (4) SAFs are identified as emission unit AA-201 and will produce 98-99% pure silicon metal. The submerged arc process is a reduction smelting operation. In the production of silicon metal, quartz is the raw material from which silicon is derived. Carbon is necessary as a reducing agent and is supplied by coal and woodchips and limestone is used as flux. Smelting in the SAF is accomplished by conversion of electric energy to heat. An alternating current applied to the electrodes causes a current to flow through the charge from the electrode tips to the furnace hearth. This provides a reaction zone of temperature up to 3600 degrees F. To maintain a uniform electric load, electrode depth is continuously varied automatically, as required. At high temperatures in the reaction zone, the carbon sources react chemically with silicon dioxide gas to form carbon monoxide and silicon metal.

Molten product from the SAFs will then be tapped from the SAF through a taphole located at the bottom of the SAF at hearth level. The molten metal and dross will flow from the taphole into a ladle. The ladle will be moved by a hoist to the casting process. The metal will be poured into low, flat pans that will provide rapid cooling of the molten metal. Fume and dust generated and captured throughout the production process including tapping will be controlled by the baghouses and then collected and reused or sold.

The process will also include four (4) natural gas-fired ladle pre-heaters rated at 10.0 MMBtu/hr each, which will be used to provide additional heat for further processing of the molten silicon to silicon flakes. The natural gas-fired ladle pre-heaters are identified as emission unit AA-202.

2.1.2.1 Potential Air Pollutant Emission Sources

Due to the nature of this operation, potential emissions of criteria air pollutants including carbon monoxide (CO), nitrogen oxide (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC), particulate matter (PM) and greenhouse gases (primarily in the form of carbon dioxide (CO_2) may occur from a) smelting in the SAF; b) combustion of natural gas in the ladle pre-heaters; and c) material ladling and casting operations.

Fume and dust generated and captured throughout this manufacturing process including tapping will be controlled by the baghouses which vents to a single exhaust stack associated with each SAF. The collected dust from the meltshop baghouses will then be collected and reused or sold.

2.1.2.2 Air Pollution Control Devices/Technologies

Four (4) baghouses will be used to capture and control PM emissions generated from the four (4) SAF operations. Good work practices will also be employed to minimize the release of regulated air pollutants from the entire meltshop operations.

2.1.2.3 Type of Release (Point or Fugitive)

All of the emissions associated with natural gas combustion in the ladle pre-heater are considered fugitive in natural and will not be routed to a control device or through a stack.

Each of the four (4) SAFs is considered a point source and will be controlled by its own baghouse. Each baghouse will have a stack with the following parameters:

- Stack Height – Approximately 300 feet above grade;
- Stack Diameter - 15 feet in diameter;
- Stack flow rate of 125,000 acfm; and
- Exhaust stack gas temperature of approximately 140 degrees F.

2.1.2.4 Calculation of Air Pollutant Emission Basis and Supporting Documentation

Potential PM emission rates from the SAFs were estimated using the recommended methods developed by EPA (i.e., AP-42). Emissions of other regulated criteria air pollutants were based on engineering design and estimates, recent permits issued or recent BACT determinations. Emissions of regulated criteria air pollutants from natural gas combustion in the ladle pre-heaters were also estimated using the recommended methods developed by EPA (i.e., AP-42). Details of the calculations and the resulting emission estimates for the SAFs can be found in Tables 2-2a, 2-2b and 2-2c. Emissions from natural gas combustion are found in Tables 2-3a, 2-3b and 2-3c. Potential regulated air pollutant emissions from the casting frames are presented in Table 2-2d.

2.1.3 Wood Chipping – AA-102b

A portable electric wood chipper will be used for as needed wood grinding/chipping and will be limited to 2080 hours per year of operation. Fugitive particulate emissions can occur from operation of the wood chipper (AA-102b). The wood chipper will include an enclosure that will minimize fugitive dust emissions. Refer to Figure 2-3 for a process flow diagram of the raw material handling and storage operations.

2.1.3.1 Potential Air Pollutant Emission Sources

Processing wood in the wood chipper has the potential to emit PM. Details of the calculations and the resulting emission estimates can be found in Tables 2-4b.

2.1.3.2 Air Pollution Control Devices/Technologies

The wood chipper will include an enclosure that will minimize fugitive dust emissions.

2.1.3.3 Type of Release (Point or Fugitive)

The PM emissions associated with wood chipping operations with be fugitive sources.

2.1.3.4 Calculation of Air Pollutant Emission Basis and Supporting Documentation

Potential fugitive PM emission rates were estimated using a PM emission factor based on Idaho Department of Environmental Quality factor for similar source (wood debarking) as referenced in Idaho air permit number 4051-00. The emission estimate assumed that PM_{10} emissions are 10% of PM emissions based on North Carolina Department of Environment and Natural Resources study "Estimating Emissions from Generation and Combustion of "Waste" Wood DRAFT" (July 15, 1998), which indicated that PM_{10} generated during milling and sawing is at most 10% of PM. The estimate is also based on the assumption that $PM_{2.5}$ emissions are equal to PM_{10} emissions. Details of the calculations and the resulting emission estimates can be found in Table 2-4b.

2.1.4 Product Refinement and Handling – AA-300

Silicon product refinement and handling occurs after the casting operations. After the metal has been cooled it will be crushed and sized to customer specifications. Any remaining undersized material will be re-melted during the casting process. The following emission units have been identified in the product refinement and handling operation (AA-301):

- AA-301 –Silicon grinding and milling operations.

Refer to Figure 2-6 for a process flow diagram of the silicon product refinement and handling operations.

2.1.4.1 Potential Air Pollutant Emission Sources

Since the silicon product refinement and handling operation will involve solid type materials, potential particulate matter (PM) emissions may occur from grinding, milling and transfer of the product.

The grinding and milling operations will be equipped with either a common baghouse or series of smaller baghouses for controlling PM emissions. Details of the calculations and the resulting emission estimates can be found in Tables 2-4a.

2.1.4.2 Air Pollution Control Devices/Technologies

The grinding and milling operations will be equipped with either a common baghouse or series of smaller baghouses for controlling PM emissions.

2.1.4.3 Type of Release (Point or Fugitive)

All of the PM emissions associated with product refinement and handling operations with be point sources.

2.1.4.4 Calculation of Air Pollutant Emission Basis and Supporting Documentation

Potential PM emission rates were estimated using the manufacturer's specifications for the baghouses and the flow rate of each control device. Details of the calculations and the resulting emission estimates can be found in Tables 2-4a.

2.2 Plantwide Operations and Activities – AA-400

The proposed silicon manufacturing plant will have additional support operations and activities including the following:

- Tank farm identified as emissions unit AA-401 including:
  - One (1) vertical oxygen storage tank with a storage capacity of 6,000 gallons; and
  - One (1) 500-gallon diesel fuel storage tank.
- Plantwide fugitive emissions from roadways identified as emissions unit AA-402 and AA-402a. Emissions represent haul trucks to support plant operations;
- Slag handling and storage identified as emission unit AA-403;
- Silica fume silos identified as emission unit AA-404; and
- Facilitywide Miscellaneous Operations Subject to APC-S-6 identified as AA-405.

2.2.1 Tank Farm – AA-401

The tank farm will include the following tanks:

- One (1) vertical oxygen storage tank with a storage capacity of 6,000 gallons; and
- One (1) 500-gallon diesel fuel storage tank.

2.2.1.1 Potential Air Pollutant Emission Sources

The oxygen storage tank does not have the potential to emit regulated air pollutants. The 500-gallon diesel storage tank has the potential to emit a regulated air pollutant (VOCs).

2.2.1.2 Air Pollution Control Devices/Technologies

All emissions of regulated air pollutants from the storage tanks will be fugitive in nature and will not include any additional control devices, other than those inherent to each tank (i.e., pressure relief valves). Good operating practices will be followed to minimize VOC emissions from the diesel storage tank.

2.2.1.3 Type of Release (Point or Fugitive)

All emissions of regulated air pollutants from the storage tanks will be will be fugitive in nature.

2.2.1.4 Calculation of Air Pollutant Emission Basis and Supporting Documentation

As per Mississippi Title V Air Permit Regulations APC–S-6 Section VII B.7 "Insignificant Activities and Emissions", the 500- gallon diesel storage tank must be listed in the application but emissions do not have to be quantified.

2.2.2 Fugitive Emissions from Roadways – AA-402 and AA-402a

PM emissions may be generated from the use of haul trucks to support plant operations. The empty haul trucks have been assumed to weigh 22 tons and have a cargo capacity of 17 tons. The majority of the trucks to enter and leave the site will be carrying materials to support the plant as well as the silicon product produced by the plant.

2.2.2.1 Potential Air Pollutant Emission Sources

Potential emissions of regulated air pollutants from the roadways will include fugitive PM and dust from trucks on paved or unpaved roads.

2.2.2.2 Air Pollution Control Devices/Technologies

All emissions of regulated air pollutants from the roadways will be fugitive in nature and will not include any additional control devices. However, dust suppression techniques will be used to minimize the amount of dust generated from vehicles on unpaved roads. These techniques include watering the roadways and other fugitive dust control techniques such as limiting the speed of the individual trucks. Good work practices will be followed for the paved road surface which will include implementing procedures to minimize the buildup of materials on the paved roadways.

2.2.2.3 Type of Release (Point or Fugitive)

All emissions of regulated air pollutants from the roadways will be will be fugitive in nature.

2.2.2.4 Calculation of Air Pollutant Emission Basis and Supporting Documentation

Potential emission rates of regulated air pollutants from the roadways were estimated using the recommended methods developed by EPA (i.e., AP-42). Details of the calculations and the resulting emission estimates can be found in Tables 2-6 and 2-6a.

2.2.3 Slag Handling and Storage – AA-403

PM emissions may be generated from the handling and storage of slag. Slag will be processed as needed in the finished product processing area; this process incorporates a fabric filter baghouse.

2.2.3.1 Potential Air Pollutant Emission Sources

Potential emissions of regulated air pollutants from slag handling will include fugitive PM.

2.2.3.2 Air Pollution Control Devices/Technologies

Slag will be processed as needed in the finished product processing area; this process incorporates a fabric filter baghouse.

2.2.3.3 Type of Release (Point or Fugitive)

All emissions of regulated air pollutants from the slag handling will be will be fugitive in nature.

2.2.3.4 Calculation of Air Pollutant Emission Basis and Supporting Documentation

Potential emission rates of regulated air pollutants from the handling of slag were estimated using the recommended methods developed by EPA (i.e., AP-42). Details of the calculations and the resulting emission estimates can be found in Tables 2-4c and 2-7d.

2.2.4 Silica Fume Silos – AA-404

Silica fumes collected in the SAF baghouses will be pneumatically transferred to the silica fume silos. In the silos, the silica fumes will be densified to about 45 lbs/cu.ft., prior to dispatch to cement and refractory manufacturers.

2.2.4.1 Potential Air Pollutant Emission Sources

Potential emissions of regulated air pollutants from the silos will include PM.

2.2.4.2 Air Pollution Control Devices/Technologies

All emissions of regulated air pollutants from the silos will be fugitive in nature and will not include any additional control devices.

2.2.4.3 Type of Release (Point or Fugitive)

All emissions of regulated air pollutants from the roadways will be will be fugitive in nature.

2.2.4.4 Calculation of Air Pollutant Emission Basis and Supporting Documentation

Potential emission rates of regulated air pollutants from the silos were estimated. Details of the calculations and the resulting emission estimates can be found in Table 2-4d.

2.2.5 Facilitywide Miscellaneous Operations Subject to APC-S-6 – AA-405

Several operations will be performed that will result in insignificant air contaminant emission rates and/or may not be regulated under state or federal air permitting requirements. These following

activities/emissions sources are not required to be included in a Title V permit application. These sources may include:

1. *New or modified pilot plants, subject to temporary source regulations located in Section III.E.*

2. *Maintenance and upkeep:*

   a. *maintenance, structural changes, or repairs which do not change the capacity of such process, fuel-burning, refuse-burning, or control equipment, and do not involve any change in quality, nature, or quantity of potential emissions of any regulated air pollutants; and*

   b. *housekeeping activities or building maintenance procedures;*

3. *Air conditioning or ventilation: comfort air conditioning or comfort ventilating systems which do not transport, remove, or exhaust regulated air pollutants to the atmosphere;*

4. *Laboratory equipment:*

   a. *laboratory equipment used exclusively for chemical or physical analysis for quality control or environmental monitoring purposes.*

5. *Hot water heaters which are used for domestic purposes only and are not used to heat process water;*

6. *Fuel use related to food preparation by a restaurant, cafeteria, residential cooker or barbecue grill where the products are intended for human consumption;*

7. *Clerical activities such as operating copy machines and document printers, except operation of such units on a commercial basis;*

8. *Hand held equipment used for buffing, polishing, carving, cutting, drilling, machining, routing, sanding, sawing, surface grinding, or turning of ceramic art work, precision parts, leather, metals, plastics, fiber board, masonry, carbon, glass, or wood;*

9. *Equipment for washing or drying fabricated glass or metal products, if no VOCs are used in the process and no oil or solid fuel is burned;*

10. *Water cooling towers (except at nuclear power plants); water treatment systems for process cooling water or boiler feed water; and water tanks, reservoirs, or other water containers not used in direct contact with gaseous or liquid process streams containing carbon compounds, sulfur compounds, halogens or halogen compounds, cyanide compounds, inorganic acids, or acid gases;*

11. *Domestic sewage treatment facilities (excluding combustion or incineration equipment, land farms, storage silos for dry material, or grease trap waste handling or treatment facilities);*

12. *Stacks or vents to prevent escape of sewer gases through plumbing traps;*

13. *Vacuum cleaning systems for housekeeping, except at a source with hazardous air pollutants;*

14. *Alkaline/phosphate washers and associated cleaners and burners;*

15. *Mobile sources;*

16. *Livestock and poultry feedlots and associated fuel burning equipment other than incinerators;*
17. *Outdoor kerosene heaters;*
18. *Equipment used for hydraulic or hydrostatic testing;*
19. *Safety devices, excluding those with continuous emissions; and*
20. *Brazing, soldering, or welding equipment that is used intermittently or in a noncontinuous mode.*

In addition, the facility may include space heaters utilizing natural or LPG gas and used exclusively for space heating, as listed in APC-S-6, VII, B:

2.3 Emergency Support Equipment – AA-501

Emergency support equipment will also support the proposed assembly plant. This equipment will consist of one (1) 670 HP emergency generator identified as AA-501. This generator will be fueled by low sulfur diesel fuel.

Air emission estimates of regulated air pollutants for the emergency generator were based on USEPA AP-42 emission factors. Hours of operation were limited to 100 per year for the generator. Tables 2-8 and 2-8a provide estimated air emissions associated with the emergency generator.

2.3.1 Potential Air Pollutant Emission Sources

Due to the combustion of diesel fuel in the emergency equipment, potential emissions of criteria air pollutants including CO, NO_x, SO_2, VOC, PM and CO_2 may occur. Minor emissions of regulated HAPs may also occur from the emergency generator.

2.3.1.1 Air Pollution Control Devices/Technologies

The emergency equipment will not have any add-on control devices or technologies. However, minimal operations and good combustion practices will be followed to minimize emissions of regulated air pollutants.

2.3.1.2 Type of Release (Point or Fugitive)

Emissions of regulated air pollutants from the emergency equipment will be a point source.

2.3.1.3 Calculation of Air Pollutant Emission Basis and Supporting Documentation

Potential emission rates of regulated air pollutants from the emergency equipment were estimated using the recommended methods developed by EPA (i.e., AP-42 program) or EPA limits defined by NSPS Subpart IIII. Details of the calculations and the resulting emission estimates can be found in Tables 2-8 and 2-8a.

Section 3: Regulatory Applicability

The proposed silicon manufacturing plant will be subject to regulations incorporated in MDEQ's Air Pollution Code (APC) for air emission sources constructed and operated in Mississippi. These rules impose permitting requirements and specific standards for air emissions. This section discusses the pertinent federal, state, and local air pollution control regulations that may be applicable to the proposed plant. These types of regulations typically include:

- Requirements to obtain a construction permit prior to commencing construction;
- Emission limitations;
- Monitoring and testing requirements; and
- Recordkeeping and reporting requirements.

This section also includes a discussion on how the proposed plant will comply with these applicable regulations.

The following sections are intended to provide the following:

- **Section 3.1. Air Quality Status** - This section identifies the current air quality status for Tishomingo County, which depending on specific air quality designation status will dictate specific air permitting requirements that must be satisfied before a construction / operating permit can be issued.

- **Section 3.2. Permitting Requirements** – This section identifies the permitting requirements required by federal and state regulations, including PSD applicability that must be satisfied prior to construction / operating permit issuance.

- **Section 3.3. State and Local Requirements** - This section identifies the state and local air pollutant regulations. Table 3-4a lists the MDEQ air regulations. Those regulations that have been deemed applicable to the plant's emission sources have been highlighted. Table 3-4b includes a summary of requirements contained in "*APC-S-1 - Section 3. Specific Criteria for Sources of Particulate Matter*" and Table 3-4c includes a summary of requirements in "*APC-S-1 - Section 4. Specific Criteria for Sources of Sulfur Compounds*". A discussion on how MS Silicon will comply with these requirements is provided in the subsections of 3.3.

- **Section 3.4. Federal Requirements, Section 3.5. NSPS Requirements and Section 3.6. NESHAP Requirements** - These sections identify the federal air pollutant regulations and Table 3-1 summarizes the federal air pollution regulations. Included in this section are tables listing the federal air regulations, including Table 3-2a which lists the New Source Performance Standards (NSPS) and Tables 3-3a and 3-3b which list the National Emission Standards for Hazardous Air Pollutants (NESHAPs). Those regulations that have been deemed applicable to the plant's

emission sources have been highlighted in the tables. A discussion on how MS Silicon will comply with these requirements is provided in the subsections of 3.4, 3.5 and 3.6. Highlighted are only those regulations that impose emission standards or limits, establish monitoring and testing requirements or enforce other relevant requirements that are intended to protect human health and welfare. Applicable requirements that identify general administrative type requirements have not been identified.

3.1 Air Quality Status

The proposed project is located in Tishomingo County, Mississippi. The current air quality status of the county is as follows:

AIR POLLUTANT	ATTAINMENT STATUS
Nitrogen Dioxides (NO_2)	Attainment
Sulfur Dioxide (SO_2)	Attainment
Particulate Matter less than 10 microns (PM_{10}) and 2.5 microns ($PM_{2.5}$)	Attainment
Carbon Monoxide (CO)	Attainment
Ozone (O_3)	Attainment
Lead (Pb)	Attainment

Since the proposed site area is classified as attainment for all regulated air pollutants, the proposed project would be governed by the regulations for attainment areas, as defined in the Mississippi rules. Attainment areas are areas defined by EPA as meeting the National Ambient Air Quality Standards (NAAQS) which were established to protect human health and welfare.

3.2 Permitting Requirements

This section identifies the permitting requirements required by state and federal regulations including PSD applicability.

3.2.1 State Requirements

APC-S-5 of the MDEQ regulations includes PSD requirements. The requirements contained in APC-S-5 have been adopted and incorporate the federal PSD requirements. The MDEQ has not created new PSD requirements nor have they modified the federal PSD requirements.

3.2.2 PSD Applicability

The PSD regulations specify that any **major** new stationary source within an air quality attainment area must undergo PSD review. A major source is defined as:

- Any stationary source (or any group of stationary sources that are located on one or more contiguous or adjacent properties, and are under common control of the same person (or persons under common control)) belonging to a single major industrial grouping and that is described in Paragraph a., b., or c. of this APC-S-5-I-A-17. For the purposes of defining "major source", a stationary source or group of stationary sources shall be considered part of a single industrial grouping if all of the pollutant emitting activities at such source or group of sources on contiguous or adjacent properties belong to the same Major Group (i.e., all have the same two-digit code) as described in the Standard Industrial Classification Manual, 1987.

- A major stationary source of air pollutants, as defined in Section 302 of the Federal Act, that directly emits or has the potential to emit, 100 tpy or more of any air pollutant subject to regulation (including any major source of fugitive emissions of any such pollutant, as determined by rule by the Administrator). The fugitive emissions of a stationary source shall not be considered in determining whether it is a major stationary source for the purposes of Section 302(j) of the Federal Act, unless the source belongs to one of the 28 designated categories of stationary sources. A list of the 28 designated source categories is found in Table 3-5a.

If the proposed project is one the 28 designated stationary sources specified in Table 3-5a, then it is subject to a PSD threshold limit of 100 tons per year. Any stationary source which is not one of the 28 designated source categories is subject to a PSD threshold of 250 tons per year or more of a regulated air pollutant.

"Potential to emit" is defined as the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design consistent with 40 CFR 52.21. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation is established in a construction permit required by the EPA approved Mississippi SIP for New Source Review (NSR) or a Title V permit. This term does not alter or affect the use of this term for any other purposes under the Federal Act, or the term "capacity factor" as used in Title IV of the Federal Act or the regulations promulgated there under.

A PSD review is triggered in certain instances when emissions associated with a new major source or emission increase resulting from a major modification are "significant". "Significant" emission thresholds are defined in two ways. The first is in terms of emission rates (tons/year) for listed air pollutants (refer to Table 3-5b) for which significant emission rates have been established.

Significant increases in emission rates are subject to PSD review in two circumstances:

- For a new source which is major for at least one regulated attainment or non-criteria pollutant (i.e., is subject to PSD review), all pollutants for which the area is not classified as nonattainment and which are emitted in amounts equal to or greater than those specified in Table 3-6 are subject to PSD review; and
- For a modification to an existing major stationary source, if both the potential increase in emissions due to the modification itself, and the resulting new emission increase of any regulated, attainment or non-criteria pollutants are equal to or greater than the respective pollutants' significant emissions rates listed in Table 3-6, the modification is "major" and are also subject to PSD review.

The second type of "significant" emission threshold is defined as any emissions rate at a new major stationary source (or any net emissions increase associated with a modification to an existing major stationary source) that is constructed within 10 kilometers of a Class I area and which would increase the 24-hour average concentration of any regulated pollutant in that area by 1 $\mu g/m^3$ or greater. Exceedance of this threshold triggers PSD review.

PSD review consists of:

- A case-by-case Best Available Control Technology (BACT) demonstration, taking into account energy, environmental, and economic impacts as well as technical feasibility for any new source or source that is physically changed;
- An ambient air quality impact analysis to determine whether the allowable emissions from the proposed project would cause or contribute to a violation of the applicable PSD increments and National Ambient Air Quality Standards (NAAQS) (refer to Table 3-6);
- An assessment of the direct and indirect effects of the proposed project on general growth, soil, vegetation, and visibility;
- Public comment, including an opportunity for a public hearing; and
- Possibly an ambient air quality monitoring program for up to one year.

An applicant may be exempt from the ambient air quality monitoring requirements if there are existing air quality monitoring data representative of the site, or if the impacts from the project are less than the monitoring de minimis concentrations listed in Table 3-6.

Tishomingo County is designated attainment, unclassifiable, or better than the national standards for all criteria air pollutants. Based on the estimated regulated criteria air pollutant emission rates associated with the proposed silicon manufacturing plant (refer to Table 2-9), emissions of $PM/PM_{10}/PM_{2.5}$, NO_x, CO, SO_2 and VOC will exceed the PSD significant emission rate (expressed in tons/year) applicability threshold. The proposed project will be considered a major source since at least one regulated air pollutant exceeds 250 tons/year.

After a careful review of the 28 designed source categories, the proposed plant is not considered one of the 28 designated source categories. One of the listed categories is secondary metal processing, which is described as the processing of metal containing materials to recover and reuse the metal. Since MS Silicon is not proposing to use scrap or other reused metals, this category was determined not to apply to the proposed plant. Thus, the plant would be subject to a 250 tons/year PSD major source applicability threshold.

Subsequently, each of above pollutants will be subject to PSD review. The requirements associated with PSD review for emissions of $PM/PM_{10}/PM_{2.5}$, NO_x, CO, SO_2 and VOC as well as MS Silicon's compliance status with these review requirements, is provided in the following sections (4.0 through 6.0) of this application.

3.3 Applicable State Requirements

Standards and limitations for visible and particulate matter emissions, sulfur emissions, organic material emissions, carbon monoxide emissions, and nitrogen oxide emissions are also contained in the state rules and regulations. These are discussed below, along with emission standards or limitations contained in these rules that may apply to the sources associated with the proposed silicon manufacturing plant. Table 3-4a provides a list of applicable and non-applicable state air pollution regulations.

3.3.1 APC-S-1 - Air Emission Regulations for the Prevention, Abatement, and Control of Air Contaminants

3.3.1.1 Section 3 – Specific Criteria for Sources of Particulate Matter

Smoke – No person shall cause, permit, or allow the emission of smoke from a point source into the open air from any manufacturing, industrial, commercial or waste disposal process which exceeds forty (40) percent opacity subject to the exceptions provided in (b) & (c).

General Nuisances – No person shall cause, permit, or allow the emissions of particles or any contaminants in sufficient amounts or of such duration from any process as to be injurious to humans, animals, plants, or property, or to be a public nuisance, or create a condition of air pollution.

Fuel Burning – Fossil Fuel Burning - The maximum permissible emissions of ash and/or particulate matter from fossil fuel burning installations shall be limited as follows: Emissions from installations of less than 10 million BTU per hour heat input shall not exceed 0.6 pounds per million BTU per hour heat input.

Manufacturing Process – General - Except as otherwise specified, no person shall cause, permit, or allow the emission from any manufacturing process, in any one hour from any point source, particulate matter in total quantities in excess of the amount determined by the relationship

$$E = 4.1\ p^{0.67}$$

Where E is the emission rate in pounds per hour and p is the process weight input rate in tons per hour.

Sampling Ports – New Equipment - The owner or operator of any new air pollution control equipment, obtained after May 8, 1970, and vented to the atmosphere, shall have necessary sampling ports and ease of accessibility.

Compliance with These Requirements

The emission sources associated with the proposed plant will be constructed and operated to satisfy the requirements contained within Section 3 of APC-S-1, refer to Table 3-4b for specific requirements.

3.3.1.2 Section 4 – Specific Criteria for Sources of Sulfur Compounds

Sulfur Dioxide Emissions from Fuel Burning – The maximum discharge of sulfur oxides from any fuel burning installation in which the fuel is burned primarily to produce heat or power by indirect heat transfer shall not exceed 4.8 pounds (measured at sulfur dioxide) per million BTU heat input.

The proposed plant will be using natural gas and low sulfur fuel oil (i.e., emergency equipment only) for plant specific fuel burning operations. Use of these fuels will easily satisfy SO_2 emission limitations required in the section. Refer to Table 3-4c for specific requirements related to this section.

3.3.1.3 Section 6 – New Sources (Subsection 3 – NSPS)

This section incorporates the Federal NSPS standards. The proposed plant will be in compliance with the applicable NSPS standards. Refer to Section 3.5 of this application for a discussion on each applicable NSPS standards.

3.3.1.4 Section 9 – Stack Height Considerations

Stack Height Effect on Emission Limitations – The degree of emission limitation required of any source for control of any air pollutants shall not be affected by so much of any source's stack height that exceeds good engineering practice (GEP) or by any other dispersion technique, except as provided as exemptions or exclusions defined within the regulation itself.

3.3.2 APC-S-2 – Permit Regulations for the Construction and/or Operation of Air Emissions Equipment

3.3.2.1 I – General Requirements (Subpart D "Permitting Requirements")

Unless otherwise provided by Sections XIII and XV, or other provisions of these Regulations, any new stationary source or modification of a stationary source must have a permit to construct or multi-media permit incorporating such permit before beginning construction.

The exhaust stacks associated with the proposed plant will be in compliance with the stack height limitations contained within Section 9.

3.3.2.2 II – General Standards Applicable to All Permits (Subpart B "General Provisions")

Applicants for all permits to construct or operate, or to renew a State Permit to Operate, shall specify in their application the air emission rate for each air pollutant subject to regulations under the Federal Act that can be reasonably expected to be emitted into the air as a result of operations from the source.

Each application must be signed by the responsible official. The signature of the applicant shall constitute an agreement that the applicant assumes the responsibility for any alterations, additions or changes in operation that may be necessary to achieve and maintain compliance with all Applicable Rules and Regulations.

No permit for the construction or relocation of equipment which will cause the issuance of air contaminants shall be issued when said equipment cannot comply with buffer zone requirements as follows: All sources of air emissions must be at least 150 feet from the nearest residential or recreational area.

The proposed plant will not be located within 150 feet of a residential or recreational area.

3.3.2.3 V – Application Review

Subsection A: Standards for Approving an Application for a Permit to Construct

- The stationary source shall be designed and constructed so as to operate without causing a violation of any Applicable Rules and Regulations.
- The stationary source shall be designed and constructed so as to operate without interfering with the attainment and maintenance of State and National Ambient Air Quality Standards.
- The stationary source shall be designed and constructed so as to operate such that the emission of air toxics does not result in an ambient concentration sufficient to adversely affect human health and well-being or unreasonably and adversely affect plant or animal life beyond the stationary source boundaries. The permit board may require the applicant to provide data necessary to evaluate the impacts of air toxics, including the predicted emission rates and ambient concentrations, when it deems necessary. The construction of the stationary source shall be performed in such a manner so as to reduce fugitive dust emission from construction activities to a minimum.

Subsection D: Certification of Construction, Beginning Operation, and Application for Permit to Operate

Upon completion of construction or installation of an approved stationary source or modification, the applicant shall notify the Permit Board that construction or installation was performed in accordance with

the approved plans and specifications on file with the Permit Board. A new stationary source issued a Permit to Construct cannot begin operation until certification of construction by the permittee.

Compliance with APC-S-2 Requirements

MS Silicon has made a good faith effort to submit adequate information required for the permit application review and will make timely efforts to submit any supplemental information requested by the state in the future. As show in the information provided, the identified air emission units will be in compliance with applicable state and federal air statutes. These air emission units were shown through atmospheric dispersion modeling that predicted concentrations should be below state and federal health standards.

3.3.3 APC-S-3 – Mississippi Regulations for the Prevention of Air Pollution Emergency Episodes

3.3.3.1 Section 4 – Emission Control Action Programs

Any person responsible for the operation of a source of air contaminant which emits 0.25 tons per day or more of air contaminants for which air standards have been adopted shall prepare emission control action programs, consistent with good industrial practice and safe operating procedures, for reducing the emission of air contaminants into outdoor atmosphere during periods of an air pollution alert, air pollution warning, and air pollution emergency. Emission control action programs shall be designed to reduce or eliminate emissions of air contaminants into the outdoor atmosphere in accordance with the objectives set forth in Tables 1-5 which are part of this Mississippi Regulation.

MS Silicon is aware of this requirement and the proposed plant will be in compliance with the rules and regulations stated under APC-S-3, Section 4.

3.3.4 APC-S-4 – Mississippi Ambient Air Quality Standards

Except for odor, as covered, below, the ambient air quality standards for Mississippi shall be the Primary and Secondary National Ambient Air Quality Standards as duly promulgated by the U.S. Environmental Protection Agency in (or to be printed in) 40 CFR Part 50, pursuant to the Federal Clean Air Act, as amended. All such standards promulgated by the U.S. Environmental Protection Agency as of June 22, 1988, are hereby adopted and incorporated herein by the Commission by reference as the official ambient air quality standards of the State of Mississippi and shall hereafter be enforceable as such (except that the word "Administrator" in said standards shall be replaced by the words "Executive Director" and the word "Agency" in said standards shall be replaced by the word "Department")

There shall be no odorous substances in the ambient air concentrations sufficient to adversely and unreasonably:

1. Affect human health and well-being;

2. Interfere with the use or enjoyment of property; or

3. Affect plant or animal life.

In determining that concentrations of such substances in the ambient air are adversely and unreasonably affecting human well-being or the use or enjoyment of property, of plant or animal life, the factors to be considered by the Commission will include, without limiting the generality of the foregoing, the number of complaints or petitioners alleging that such a condition exists, the frequency of the occurrence of such substances in the ambient air as confirmed by the Department of Environmental Quality staff, and the land use of the affected area.

MS Silicon is aware of this requirement and the proposed plant will be in compliance with the rules and regulations stated under APC-S-4.

3.3.5 APC-S-5 – Mississippi Regulations for the Prevention of Significant Deterioration of Air Quality

This section incorporates the Federal PSD standards. The proposed plant will be in compliance with the applicable standards. Refer to Section 3.2.2 of this application for applicable PSD standards.

3.4 Applicable Federal Requirements

USEPA has developed regulations that are designed to control air pollution. These regulations include permitting requirements for new or modified major stationary sources located in non-attainment areas, as well as Standards of Performance for certain types of new sources.

Provided below is a summary of the federal regulatory requirements potentially triggered by the proposed silicon manufacturing plant. Other federal requirements not listed in the table below were determined to be not applicable to the proposed operations.

Summary of Potentially Applicable Federal Regulatory Requirements

Air Regulation	Applicability Determination	Compliance Status
40 CFR Part 60 – New Source Performance Standards (NSPS)		
Subpart A – General Provisions	The proposed plant is subject to this requirement because construction commenced after 1/5/1981. Applicability of the General Provisions is trigged based on the plant triggering Subparts Z and IIII.	The proposed plant will be in compliance with these Subparts

Air Regulation	Applicability Determination	Compliance Status
Subpart Z – Ferroalloy Production Facilities	The proposed semi-enclosed submerged arc furnace is subject to this requirement because the SAF will produce silicon metal and construction commenced after 10/21/1974.	The proposed SAF will be in compliance with this Subpart
Subpart OOO – Nonmetallic Mineral Processing Plants	The proposed silicon manufacturing plant is not subject to this subpart because the plant will not be crushing or grinding any nonmetallic minerals. Quartz will be used in the manufacturing process but will not be crushed prior to use in the semi-enclosed submerged arc furnace.	NA
Subpart IIII – Stationary Compression Ignition Internal Combustion Engines	The proposed diesel-fired emergency generators are subject to this subpart because they have displacement of less than 30 liters per cylinder and are 2007 model year or later.	The proposed emergency generators will be in compliance with this Subpart
40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants (NESHAPs) (MACT)		
40 CFR Part 63, Subpart A – General Provisions	The proposed plant is subject to this subpart because the plant will be considered an area source of HAP emissions. Applicability of the General Provisions is trigged based on the emergency equipment triggering Subpart ZZZZ.	The plant will be in compliance with this Subpart
Subpart ZZZZ - Stationary Reciprocating Internal Combustion Engines	The proposed emergency generators are subject to this subpart because the emergency equipment meets the definition of a reciprocating internal combustion engines (RICE). This subpart has specific requirements for specified engine types at area and major sources of HAP emissions. The proposed fire pumps will be rated below the applicability threshold under this rule.	The emergency equipment will be in compliance with this Subpart
JJJJJJ - Area Sources: Industrial, Commercial, and Institutional Boilers	This subpart applies to industrial, commercial, or institutional boilers located at an area source of HAPs. The proposed natural gas fired ladle pre-heaters and electric fired semi-enclosed submerged arc furnaces do not meet the definition of a boiler thus are not subject to this subpart.	NA
YYYYYY - Area Sources: Ferroalloys	This subpart applies to ferroalloy production facilities that manufacture silicon metal and are an area source of HAPs. The	The SAF will be in compliance with this

Air Regulation	Applicability Determination	Compliance Status
Production Facilities	proposed plant will manufacture silicon metal and is an area source of HAPs thus is subject to this subpart.	Subpart
Additional Federal Regulations		
40 CFR Part 64 – Compliance Assurance Monitoring (CAM)	The proposed plant is subject to this subpart since the plant is not subject to a MACT standard proposed after 11/15/1990.	The plant will be in compliance with this Subpart
40 CFR Part 68 – Chemical Accident Prevention Provisions	MS Silicon does not anticipate processing any chemicals that would trigger applicability of the accidental release prevention requirements.	NA
40 CFR Part 82, Subpart F – Recycling and Emissions Reduction	MS Silicon does not anticipate producing or consuming any ozone-depleting substances that would trigger applicability of the protection of stratospheric ozone requirements. MS Silicon will abide by the applicable requirements that involve replacement of ozone depleting substances in plant process equipment (i.e., air conditioners, refrigerators, chillers or freezers).	The plant will be in compliance with this Subpart

Refer to Tables 3-1, 3-2a, 3-3a and 3-3b for inclusive lists showing applicable and non-applicable federal air pollution regulations for the proposed plant.

3.5 New Source Performance Standards (NSPS)

The NSPS have been developed by USEPA for specific source categories. These standards, which are codified in the Code of Federal Regulations (CFR) under Part 60 (40 CFR 60), apply to applicable equipment covered under each source category that is constructed, reconstructed or modified after a specific baseline date. A review of the existing NSPS, as well as any NSPS being proposed, was performed to determine applicability to the proposed project. Refer to Table 3-2a for a list of the NSPS regulations.

3.5.1 40 CFR Part 60, Subpart Z – Standards of Performance for Ferroalloy Production Facilities

40 CFR Part 60, Subpart Z applies to the following affected facilities "*electric submerged arc furnaces which produce silicon metal, ferrosilicon, calcium silicon, silicomanganese zirconium, ferrochrome silicon, silvery iron, high-carbon ferrochrome, charge chrome, standard ferromanganese, silicomanganese,*

ferromanganese silicon, or calcium carbide; and dust-handling equipment". This subpart applies to any facility that commences construction or modification after October 21, 1974.

According to Subpart Z, electric submerged arc furnace means "*any furnace wherein electrical energy is converted to heat energy by transmission of current between electrodes partially submerged in the furnace charge*" and silicon metal means "*any silicon alloy containing more than 96 percent silicon by weight*". The proposed silicon manufacturing plant will be subject to Subpart Z since it meets the definition of a ferroalloy production facility and will commence construction after October 21, 1974.

The proposed silicon manufacturing plant including the semi-enclosed submerged arc furnace will be subject to the emission limitations, testing, monitoring, reporting and recordkeeping requirements contained in this Subpart. According to this Subpart, an initial performance test should be conducted based on 60.8.

Standards for Particulate Matter

Based on 60.262 – Standard for Particulate Matter, the following limits should be met for each submerged arc furnace:

- Exit from a control device and contain PM in excess of 0.45 kg/MW-hr (0.99 lb/MW-hr) while silicon metal, ferrosilicon, calcium silicon, or silicomanganese zirconium is being produced;
- Exit from a control device and exhibit 15 percent opacity or greater;
- Exit from an electric submerged arc furnace and escape the capture system and are visible without the aid of instruments;
- Escape the capture system at the tapping station and are visible without the aid of instruments for more than 40 percent of each tapping period; and
- Dust-handling equipment should not discharge any gases which exhibit 10 percent opacity or greater.

Standards for Carbon Dioxide

According to 60.263 – Standards for Carbon Monoxide, the submerged arc furnace should not discharge any gases which contain, on a dry basis, 20 or greater volume percent of CO.

This subpart states that the owner or operator shall install, calibrate, maintain and operate a continuous monitoring system for measurements of the opacity of emissions discharged into the atmosphere from the control device and also requires the owner/operator of an electric arc furnace to maintain daily records.

Operating Requirements

Section 60.265 of this subpart also states that a continuous monitoring device should be installed to continuously record the furnace power input, and the volumetric flow rate through each separately ducted hood of the capture system.

MS Silicon is aware of the requirements contained in this subpart and will be in compliance with all of the applicable requirements. The applicable requirements of 40 CFR 60, Subpart Z are summarized in Table 3-2b.

3.5.2 40 CFR Part 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

This subpart applies to stationary compression ignition (CI) internal combustion engines (ICE) that commence construction after July 11, 2005, where the CI ICE are manufactured after April 1, 2006 (and are not fire pump engines), or manufactured after July 1, 2006 (for certified National Fire Protection Association fire pump engines).

NSPS Subpart IIII specifies emission limitations, monitoring, reporting, and recordkeeping requirements for NO_x, CO, non-methane hydrocarbons (NMHC) and PM. Applicable NSPS IIII emission standards for the emergency generator and fire water pump CI ICEs are summarized as follows:

- Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder that are not fire pump engines must comply with the emission standards for new non-road CI engines in 40 CFR 60.4202, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.

- Owners and operators of fire pump engines with a displacement of less than 30 liters per cylinder must comply with the emission standards in Table 4 to NSPS Subpart IIII, for all pollutants.

NSPS Subpart IIII also stipulates specific sulfur requirements for diesel fuels. Beginning October 1, 2007 engines that use diesel fuel must meet a sulfur content of 0.05% by weight (40 CFR 80.510(a)). As of October 1, 2010 engines with a displacement of less than 30 liters/cycle and that use a diesel fuel must meet a sulfur content of 0.0015% by weight.

MS Silicon will be utilizing a diesel fuel with a sulfur content of 0.0015% by weight or less. The emergency generator is designed to have a displacement of less than 30 liters per cylinder and will comply with the applicable requirements of NSPS Subpart IIII. The applicable requirements of 40 CFR 60, Subpart IIII are summarized in Table 3-2c.

3.5.3 40 CFR Part 60, Subpart OOO – Standards of Performance for Nonmetallic Mineral Processing Plants

Applicability of Subpart OOO applies to affected facilities in fixed or portable nonmetallic processing plants, including each crusher, grinding plant, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin, and enclosed truck loading station. Nonmetallic mineral processing plant means any combination of equipment that is used to crush or grind any nonmetallic mineral at any type of plant. Nonmetallic mineral means any of the following minerals or any mixture of which the majority is any of the following minerals *"(1) Crushed and Broken Stone, including Limestone, Dolomite, Granite, Traprock, Sandstone, Quartz, Quartzite, Marl, Marble, Slate, Shale, Oil Shale, and Shell."*

This subpart contains standards for particulate matter, monitoring of operations, test methods and procedures as well as reporting and recordkeeping requirements.

Based on the design of the proposed silicon manufacturing plant, it does not appear that the plant will be considered a nonmetallic mineral processing plant since the quartz used in the process will not be used in any crushing or grinding processes. Thus, this subpart is not applicable to the proposed plant.

3.6 Hazardous Air Pollutant Regulations

The proposed plant will have the potential to emit regulated HAPs in quantities **less than 10 tons/year as an individual HAP and 25 tons/year in aggregate**; therefore, the proposed plant is considered a minor source of HAPs.

On December 15, 1996, the USEPA promulgated the final regulations implementing Section 112(g). This section addresses new and reconstructed major sources of hazardous air pollutants (HAPs). A primary requirement of this section is that those sources apply Maximum Achievable Control Technology (MACT) for control of HAPs. Section 112(g) is intended to address those sources for which USEPA has not yet established an intended source category specific MACT standard. In this sense, Section 112(g) may be seen as the "case-by-case" MACT standard.

The proposed project will not trigger case-by-case MACT since this requirement applies to new or reconstructed major stationary sources of hazardous air pollutant emissions.

USEPA has developed National Emission Standards for Hazardous Air Pollutants (NESHAP) for numerous source categories. Refer to Tables 3-3a and 3-3b for an all-inclusive list of the NESHAP and MACT standards.

3.6.1 40 CFR Part 63, Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants: Stationary Reciprocating Internal Combustion Engines

Pursuant to 40 CFR 63.6585, the proposed silicon manufacturing plant, is subject to the NESHAP for Stationary Reciprocating Internal Combustion Engines, since it will utilize stationary internal combustion reciprocating engines (RICE). The proposed emergency generator will have an initial rating of 670 HP thus making it an affected source.

MS Silicon is aware of the requirements imposed by 40 CFR 63, Subpart ZZZZ; and selection of the final generator type and size will confirm the general requirements as they pertain to emergency generators located at area sources of HAP emissions.

The applicable requirements of 40 CFR 60, Subpart ZZZZ are summarized in Table 3-3c.

3.6.2 40 CFR Part 63, Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers

40 CFR Part 63, Subpart JJJJJJ applies to all industrial, commercial, or institutional boilers that are located at, or are part of, an area source of HAPs.

According to this Subpart, boiler means "*an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam or hot water. Controlled flame combustion refers to a steady-state or near steady-state, process wherein fuel and/or oxidizer feed rates are controlled. Waste heat boilers are excluded from this definition.*"

This subpart does not apply since no boilers are being installed at the proposed plant.

3.6.3 40 CFR Part 63, Subpart YYYYYY - National Emission Standards for Hazardous Air Pollutants for Area Sources: Ferroalloy Production Facilities

This subpart applies to ferroalloys production facilities in an area source of HAP emissions. A ferroalloy production facility manufactures silicon metal, ferrosilicon, ferrotitanium using the aluminum reduction process, ferrovanadium, ferromolybdenum, calcium silicon, silicomanganese zirconium, ferrochrome silicon, silvery iron, high-carbon ferrochrome, charge chrome, standard ferromanganese, silicomanganese, ferromanganese silicon, calcium carbide or other ferroalloy products using electrometallurgical operations including electric arc furnaces (EAFs) or other reaction vessels. An electrometallurgical operation affected source is new if construction or reconstruction of the EAF or other reaction vessel commenced after September 15, 2008.

This subpart contains opacity standards along with monitoring, testing, notification, reporting and recordkeeping requirements.

The proposed silicon manufacturing plant is considered a ferroalloy production facility and will be installing four semi-enclosed submerged arc furnaces. Since the facility will be considered an area source of HAPs, the requirements of this subpart are applicable. MS Silicon is aware of the requirements contained in this subpart and will be in compliance with all of the applicable requirements. The applicable requirements of 40 CFR 60, Subpart YYYYYY are summarized in Table 3-3d.

3.7 Title V Greenhouse Gas Tailoring Rule

The greenhouse gas tailoring rule sets thresholds for the greenhouse gas (GHG) emissions that define when permits under the PSD and Title V Operating Permit programs are required for new and modified industrial facilities. If the proposed project is one the 28 designated stationary sources specified in Table 3-5a, then it is subject to a criteria pollutant PSD threshold limit of 100 tons per year. Any stationary source which is not one of the 28 designated source categories is subject to a criteria pollutant PSD threshold of 250 tons per year or more. While these thresholds are appropriate for criteria pollutants, they are not feasible for GHGs because GHGs are emitted in much higher volumes. Without the tailoring rule, the lower emissions thresholds would have automatically taken effect on January 2, 2011. EPA has phased in the CAA permitting requirements for GHGs in three steps.

3.7.1 Step 1 - January 2, 2011 – June 30, 2011

Step 1 states that the permitting requirements for GHG emissions would only be subject to those sources currently subject to PSD requirements. BACT would need to be determined for sources that have an increase in total GHG emissions of at least 75,000 tpy, on a CO_2e basis. During this time, no sources would be subject to Clean Air Act permitting requirements due solely to GHG emissions.

3.7.2 Step 2 - July 1, 2011 – June 30, 2013

In Step 2, PSD permitting requirements cover new construction projects that emit GHG emissions of at least 100,000 tpy even if they do not exceed the permitting thresholds for other pollutants. Modifications at existing facilities that cause an increase of at least 75,000 tpy of GHG emissions are also subject to the permitting requirements. During this step, operating permit requirements apply to sources based on their GHG emissions even if they would not apply based on emissions of other pollutants. Facilities that emit at least 100,000 tpy CO_2e are subject to Title V permitting requirements.

3.7.3 Step 3 - June 30, 2013

On February 24, 2012, the U.S. Environmental Protection Agency (EPA) proposed to keep greenhouse gas (GHG) permitting thresholds at current levels. This step continues to focus GHG permitting on the largest emitters by retaining the permitting thresholds that were established in Steps 1 and 2.

As show in Section 2, the potential CO_2e emissions from the proposed silicon manufacturing plant are approximately 403,000 tons/year and are above the 75,000 tons/year threshold. As a result, emissions of GHG's will be subject to PSD review, which essentially entails a BACT evaluation (refer to Section 4 of this document).

3.8 Compliance Assurance Monitoring

Pursuant to requirements concerning enhanced monitoring and compliance certification under the Clean Air Act, EPA has promulgated regulations (40 CFR 64) to implement compliance assurance monitoring (CAM) for major stationary sources of air pollution that are required to obtain operating permits under Title V of the Act. The regulations require owners or operators of such sources to conduct monitoring that satisfies particular criteria established in the rule to provide a reasonable assurance of compliance with application requirements under the Act. Monitoring focuses on emissions units that rely on pollution control device equipment to achieve compliance with applicable standards. The effective date of this rule was November 21, 2007. **Compliance with the requirements of this Part will be addressed as part of the proposed plant's Part 70 Operating Permit initial application process**.

3.9 Accidental Release Provisions

Federal chemical accidental release prevention requirements have been established in 40 CFR Part 68. These requirements cover risk management planning at facilities with more than a threshold quantity of a listed regulated substance in a single process. The rule lists 77 acutely toxic substances with threshold quantities ranging from 500 to 20,000 pounds, and also lists an additional 63 flammable gases and volatile liquids, each with a 10,000 pound threshold quantity as part of the proposed repowering project. **MS Silicon does not anticipate processing any chemicals that would trigger applicability of the accidental release prevention requirements.**

3.10 Protection of Stratospheric Ozone

The requirements for the protection of stratospheric ozone have been established in 40 CFR Part 82. These requirements were created to impose limits on the production and consumption of certain ozone-depleting substances. The purpose of 40 CFR 82 Subpart F, "Recycling and Emissions Reduction", is to reduce emissions of class I and class II refrigerants and their substitutes to the lowest achievable level by maximizing the recapture and recycling of such refrigerants during the service, maintenance, repair, and disposal of appliances. This Subpart applies to the servicing, maintaining, or repairing of appliances and also applies to the disposal of appliances.

MS Silicon may be involved in the servicing, maintaining or repairing of equipment subject to the handling and recycling provisions of this subpart. MS Silicon will follow the requirements as mandated by this subpart.

3.11 Mandatory Greenhouse Gas Reporting

40 CFR 98 established mandatory greenhouse gas (GHG) reporting requirements for owners and operators of certain facilities that directly emit GHG as well as for certain fossil fuel supplies and industrial GHG suppliers.

Included in this rule is the requirement to quantify and report GHG emissions on an annual basis. The first report was due to USEPA on March 31, 2011 for emissions released during the calendar year 2010.

MS Silicon is aware of this requirement and will evaluate its applicability and reporting requirements upon operation of the proposed plant.

Section 4: Best Available Control Technology (BACT)

4.1 Background

4.1.1 Best Available Control Technology (BACT) Evaluation Process

The following section describes the process of evaluating and defining BACT for emissions of PM_{10}, $PM_{2.5}$, NO_2, CO, SO_2 and GHG associated with the proposed silicon metal manufacturing process. Any major stationary source or major modification subject to PSD must conduct an analysis to ensure the application of best available control technology (BACT). The requirement to conduct a BACT analysis and determination is set forth in section 165(a)(4) of the Clean Air Act (Act), in federal regulations at 40 CFR 52.21(j), in regulations setting forth the requirements for State implementation plan approval of a State PSD program at 40 CFR 51.166(j), and in the SIP's of the various States at 40 CFR Part 52, Subpart A - Subpart FFF.

4.1.2 Process Description

The proposed plant will consist of a silicon manufacturing plant. The silicon manufacturing process consists of the continuous reduction of quartz (SiO_2) into silicon by a reducing mixture according to the simplified relation:

$$SiO_2 + 2C \rightarrow Si + 2CO.$$

As components of the mixture, carbon in the form of mineral carbon, petroleum coke, and wood-chips can be used. The electric current runs through the electrode between the contact plates and the tip of the electrode causing the ignition of the electric arc with its extremely high temperatures (> 2000°C) necessary for the reduction of quartz into silicon. The silicon is then tapped from the bottom of the submerged arc furnace.

The following emission sources will be included in this BACT analysis:

- Silicon Manufacturing Process (as defined in AP 42, Fifth Edition, Volume I, Chapter 12.4: Metallurgical Industry, Ferroalloy Production):
    - Submerged Arc Furnaces - Smelting in an electric arc furnace is accomplished by conversion of electrical energy to heat. An alternating current applied to the electrodes causes' current to flow through the charge between the electrode tips. This provides a reaction zone at temperatures up to 2000°C (3632°F). The tip of each electrode changes polarity continuously as the alternating current flows between the tips. The carbonaceous material in the furnace charge reacts with oxygen in the metal oxides of the charge and reduces them to base metals. The reactions produce large quantities of carbon monoxide (CO) that passes upward through the furnace charge. Large amounts of carbon monoxide and organic materials also are emitted by submerged electric arc furnaces. Carbon monoxide is

formed as a byproduct of the chemical reaction between oxygen in the metal oxides of the charge and carbon contained in the reducing agent (coke, coal, etc.). Reduction gases containing organic compounds and carbon monoxide continuously rise from the high-temperature reaction zone, entraining fine particles and fume precursors. The mass weight of carbon monoxide produced sometimes exceeds that of the metallic product. The heat-induced fume consists of oxides of the products being produced and carbon from the reducing agent. The fume is enriched by silicon dioxide, calcium oxide, and magnesium oxide, if present in the charge.

- Natural Gas Fired Ladle Preheaters;
- Material Handling – Receiving, Material Handling, Storage and Truck Loadout – Includes the following materials:
  - Coal;
  - Wood; and
  - Quartz.
- Product Refining;
- Fugitive Emissions from Roadways; and
- Emergency Support Equipment.

4.1.3 Definition of BACT

The BACT requirement is defined as:

"an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

4.1.3.1 BACT Demonstration Approach

BACT by definition is the most effective control option which is technically feasible considering economic, energy, and other environmental impacts. Control options can be eliminated as BACT on a basis of technical, economic, energy, or environmental considerations. The determination of BACT follows a Top-Down approach. In the top-down approach, progressively less stringent control technologies are analyzed until a level of control considered BACT is reached on the basis of environmental, energy and economic impacts. The key steps in the Top-Down process are as follows:

STEP 1: Identify Available Control Technologies: For the source, emissions unit, activity, or process requiring BACT, identify and list all "available" emissions control options for each pollutant. Available control options are those control technologies and techniques with a practical potential for application to the source, emissions unit, activity, or process. In general, any control option in commercial use in the United States at the time the analysis is performed should be included on the list of available control options.

STEP 2: Eliminate Technically Infeasible Options: Considering site-specific factors and constraints, remove from the list compiled in STEP 1 all technically infeasible control options. A control option can be considered as technically infeasible if technical difficulties such as physical, chemical, or engineering constraints would preclude the successful use of the control option in the particular application in question. For all control options eliminated, demonstration that a control option is technically infeasible should be clearly documented in the BACT Analysis and included with the BACT submittal.

STEP 3: Rank Remaining Control Technologies by Control Effectiveness: Rank and list all remaining control options in order of control effectiveness with the most effective control alternative at the top of the list. As noted above, the control technologies to be evaluated and ranked will apply to those associated with controlling emissions from similar emission sources.

STEP 4: Energy, Environmental, and Economic Considerations: Using the "Top Down" procedure specified below, control options may be eliminated as BACT candidates on the basis of energy, environmental, and economic impacts of the option. Energy impacts include but are not limited to energy efficiency impacts, fuel cycle efficiency considerations, and fuel availability. Environmental impacts include but are not limited to ground water and water impacts, solid and hazardous waste impacts, and air quality impacts from increases in emissions of other air pollutants that result from implementing the control option. Economic impacts include the sum of up-front capital cost and annual operation and maintenance costs of implementing the control option.

A control option may be eliminated as a BACT candidate on grounds of significant energy, environmental, or economic impacts. Rationale for eliminating a control option should be well documented and included in the analysis. Economic impacts should be evaluated by comparing the cost effectiveness of the control option with generally acceptable cost effectiveness ranges for control of the particular pollutant in question.

The Top Down process is defined in Steps 4A through 4E below:

- **STEP 4.A:** Start with the most effective control option from the list compiled in STEP 3 (i.e., those associated with controlling emissions from similar emission units.
- **STEP 4.B:** Provide the information specified in items (a) through (g) below for the control option being considered.

  a. **Control Efficiency:** Enter the percent of the pollutant removed by the control option. Control efficiency should be calculated based on the control achieved from the control option in question only.

  b. **Potential Emissions:** Potential emissions in pounds of pollutant per hour and tons of pollutant per year should be calculated based on the maximum potential to emit rather than actual emissions. Potential emissions represent the maximum capacity of a source, emissions unit, process, or activity to emit an air pollutant under physical constraints considering air pollutant emission controls and applicable regulatory limits. Operational factors such as hours of operation or partial loading which influence emissions may be included as constraints which limit the potential to emit provided that the project proponent agrees to incorporate these constraints in enforceable regulatory compliance limits.

  c. **Expected Emissions:** Expected emissions in tons of pollutant per year should be calculated considering expected operational considerations such as down time for maintenance, periods of partial load, capacity factors, etc.

  d. **Annual Expected Emission Reduction:** Using the expected emission rate computed in "c" and control efficiency entered in "a", compute the expected annual emission reduction in tons per year.

  e. **Annual Cost of Control Option:** Compute the annual cost of the control option using standard economic principles. Annual cost should include both the initial capital costs as well as operation and maintenance costs. All costs should be amortized over the expected life of the control option (default is ten years). Include in the analysis the calculations, assumptions, and economic parameters used in the calculations.

  f. **Cost Effectiveness:** Cost effectiveness is the ratio of the annual cost computed in "e" to the annual expected emission reduction computed in "d".

  g. **Other Considerations:** List all other media impacts (water, solid waste, etc.) and energy impacts which are associated with the control option.

- **STEP 4.C:** If there are no outstanding issues regarding energy, environmental and economic impacts the analysis is ended and this control option is proposed as BACT.
- **STEP 4.D:** In the event that the control option is determined to be inappropriate due to energy, environmental, or economic impacts, this control option is eliminated and the analysis proceeds to the next control option on the list. Rationale for elimination of a control option on grounds of significant energy, environmental or economic impacts should be well documented and included with the analysis.
- **STEP 4.E:** Go to STEP 4.B and proceed with the analysis for the next control option on the list.

STEP 5: Documentation: Include with the analysis all information, calculations, assumptions, and data used in making the BACT determination.

Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

4.2 Best Available Control Technology (BACT) Analysis - Emissions of Greenhouse Gases (GHG)

This evaluation follows the guidance developed by USEPA during 2010 under the Tailoring Rule. Under this rule, any project occurring after July 1, 2011 and having a net increase of equal to or greater than 75,000 tons/year of CO_2 on an equivalence basis triggers a BACT evaluation. As defined in USEPA's document entitled "PSD and Title V Permitting Guidance for Greenhouse Gases", dated March 2011, the BACT evaluation process is required to include five (5) steps. These steps are essentially those steps that make up the Top-Down evaluation process.

This BACT evaluation focused on the control technologies that have been demonstrated and commercially available for equipment associated with silicon production. Because of the importance of controlling GHG emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of GHG will be controlled to the levels specified. Technologies or concepts for controlling GHG emissions are and will continue to emerge on paper and on a trial basis. Since these technologies have not been proven to be reliable (i.e., demonstrated technologies), evaluation of these technologies are not being addressed in this BACT evaluation. MS Silicon is very reluctant to install a non-proven technology that may require significant on-site adjustments, while at the same time not meeting required GHG emission limits.

4.2.1 GHG Emission Sources Subject to Control Technology Evaluation

The following GHG emission sources are present at silicon manufacturing operations:

- Semi-Enclosed Submerged Arc Furnaces (AA-201);
- Natural Gas Combustion Equipment (AA-202); and
- Emergency Equipment (AA-501).

For a summary of the estimated GHG emission rates for the sources identified above, please refer to the following table.

GHG Emission Rates for Sources Evaluated for BACT

Equipment Description	GHG CO_2e Emission Rate (tons/year)
AA-201 - Semi-Enclosed Submerged Arc Furnaces (4 SAFs)	381,866
AA-202 - Natural Gas Combustion Equipment	20,499
AA-501 - Emergency Generator	32
TOTAL	402,397

A summary of the BACT determinations for GHG emissions is presented in Table 4-1.

4.2.2 BACT Analysis for GHG Emissions from Silicon Manufacturing

The production of ferroalloys results in emission of greenhouse gases. In ferroalloy production, raw ore, carbon materials and slag forming materials are mixed and heated to carbon sources. While CO_2 is the main greenhouse gas from ferroalloy production, recent research has shown that CH_4 and N_2O account for an equivalent greenhouse gas emission of up to 5 % of the CO_2 emissions from ferrosilicon (FeSi) and silicon-metal (Si-metal) production.[1]

The most significant greenhouse gas (GHG) emissions are related to the generation of carbon dioxide during the chemical reactions occurring in the metallurgical furnaces, where carbon is used to reduce the quartz to silicon metal. The second source of CO_2 emissions in silicon metal production comes from the use of natural gas in combustion processes. **The use of emergency equipment is limited to 100 hours per year and generates an insignificant amount of GHG and thus will not be included in this BACT analysis.**

4.2.3 BACT Analysis for GHG Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step One - Identify Available GHG Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for

[1] Greenhouse Gas Emissions from Ferroalloy Production. T. Lindstad, S.E. Olsen, G. Tranell, T. Færden and J. Lubetsky, 2007

controlling GHG emissions from semi-enclosed submerged arc furnaces used in silicon production operations:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

Review of the above sources did not identify information on controlling GHG emissions from the semi-enclosed submerged arc furnaces used in silicon production processes. In electric arc furnaces, electrical resistance generates the heat required: the resistance in a SAF furnace is the atmosphere, while in a submerged-arc furnace the slag or charge forms the resistance. No control options for emissions from the SAF were identified in this review.

The possible control options that will be evaluated have been divided into two (2) distinct areas; 1) energy efficiency improvement options, and 2) add-on controls. The application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity. Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions. While energy efficiency can reduce emissions of all combustion-related emissions, it is a particularly important consideration for GHGs since the use of add-on controls to reduce GHG emissions is not as well advanced as it is for most combustion-derived pollutants.

Opportunities to further improve energy efficiency from electric arc furnaces in general are described below[2].

Control Measure	Description	Discussion
Improved Process Control	Process control can optimize operations and thereby significantly reduce electricity consumption. Control and monitoring systems for SAF are moving towards integration of real-time monitoring of process variables	This control measure is feasible and will be included in the SAF design.
Adjustable Speed Drives	As flue gas flow varies over time, adjustable speed drives offer opportunities to operate dust collection fans in a more energy efficient manner.	This control measure is feasible and will be included in the SAF design.
Transformer Efficiency—Ultra-High–Power	Ultra-high–power (UHP) transformers help to reduce energy loss and increase productivity. Location of the furnace transformers minimizing the length of the HV	This control measure is feasible and will be included in the SAF design.

[2] Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Iron and Steel Industry

Control Measure	Description	Discussion
Transformers	cables, less power losses.	
Post-Combustion of the Flue Gases	Post-combustion is a process for utilizing the chemical energy in the CO and hydrogen evolving to heat the SAF ladle or to preheat other materials 570-1,470°F (300-800°C). It reduces electrical energy requirements and increases the productivity of the SAF.	This control measure is not applicable to the silicon metal production process. There are no post combustion processes for silicon metal. This control measure will be excluded from further consideration in this BACT analysis.
Direct Current Arc Furnace	The direct current (DC) arc furnace was pioneered in Europe, and these single-electrode furnaces have recently been commercialized in North America. The DC arc furnaces use DC rather than alternating current (AC). In a DC furnace one single electrode is used, and the bottom of the vessel serves as the anode. However, compared to new AC furnaces, the savings are limited.	This technology is feasible but the technology has been only tested on an experimental scale with poor results. Direct current arc furnaces have never been performed on a large scale for silicon metal production. This control measure will be excluded from further consideration in this BACT analysis.
Engineered Refractories	Refractories in SAF have to withstand extreme conditions such as temperatures over 2,900°F (1,600°C), oxidation, thermal shock, erosion and corrosion. Refractories can be provided by a controlled microstructure: alumina particles and mullite microballoons coated uniformly with carbon and carbides.	This control measure is feasible and will be included in the SAF design.
Airtight Operation	A large amount of air enters the SAF: around 1,000,000 ft^3 (30,000 m^3) in a standard SAF. This air is at ambient temperature, and the air's nitrogen and non-reactive oxygen are heated in the furnace and exit losses. The potential benefit for an industrial furnace with an airtight process including a post combustion practice and an efficient fume exhaust control are about 100 kWh/ton for an industrial furnace having a current electric consumption of 450 kWh/ton.	The furnace is semi-closed. In order to charge the furnace with the raw materials and place them in the proper position, the furnace doors will need to be open in order to "push the raw materials" using the "stoking machine" into place. Doors will be closed when not needed.
Flue Gas Monitoring and Control	The use of VSDs can reduce energy usage of the flue gas fans, which in turn reduces the losses in the flue gas.	This control measure is feasible and will be included in the SAF design.

Control Measure	Description	Discussion
Bottom Tapping	Bottom tapping leads to slag-free tapping, shorter tap-to-tap times, reduced refractory and electrode consumption, and improved ladle life	This control measure is feasible and will be included in the SAF design.
Carbon Capture and Storage	Carbon capture and storage involves separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 via pipeline, and finally injection and long-term geologic storage of the captured CO_2. Several different technologies, at varying stages of development, have the potential to separate and capture CO_2. Some have been demonstrated at the slip-stream or pilot-scale, while many others are still at the bench-top or laboratory stage of development	See below.

Step Two – Eliminate Technically Infeasible Control Options

All of the control options identified under Step 1 with the exception of Direct Current Arc Furnace, Post-Combustion of the Flue Gases, and Carbon Capture and Storage are technically feasible and will be included in this BACT evaluation.

Carbon capture and sequestration (CCS) has not been applied to SAFs in the past and has not been demonstrated in practice for these emission types. CCS is generally used for facilities with sources emitting CO_2 in large amounts, such as fossil fuel-fired power plants, and for industrial facilities with high-purity CO_2 streams.

CCS involves capturing CO_2, transporting it as necessary, and permanently storing it instead of releasing it into the atmosphere. The process involves three main steps:

- Capturing CO_2 at its source by separating it from other gases produced by an industrial process. Once CO_2 is separated and captured, it then can be compressed under high pressure for transport to an appropriate geological storage site;
- Transporting the captured CO_2 to a suitable storage location (typically in compressed form); and
- Storing the CO_2 away from the atmosphere for a long period of time, for instance in underground geological formations, in the deep ocean, or within certain mineral formations.

The process of transporting CO_2 is typically considered via pipeline and has substantial associated logistic hurdles and operational penalties. Transportation infrastructure issues include pipeline routing, acquisition of rights-of-way, and associated environmental impacts. In addition, additional energy must be expended to compress and transport the compressed CO_2. An alternative means of transporting the

compressed CO_2 is via a ship, similar to transporting liquid natural gas. Again, there are similar logistic hurdles and operational penalties for transporting compressed CO_2 via ship that can be substantial.

Carbon sequestration usually involves the injection of CO_2 into deep geological formations of porous rock that are capped by one or more nonporous layers of rock. Injected at high pressure, the CO_2 exists as a liquid that flows through the porous rock to fill the voids. Saline formations, exhausted oil and gas fields, and unmineable coal seams are candidates for CO_2 storage. Also, CO_2 injected for enhanced oil recovery projects can result in long-term sequestration depending on the geologic conditions. Other schemes include liquid storage in the ocean, solid storage by reactions leading to the creation of carbonates, and terrestrial sequestration. This type of infrastructure does not exist at the proposed plant site.

Another important technical consideration is that carbon capture is simpler when CO_2 is produced in high purity and high concentration streams as the byproduct of certain industrial processes, such as natural gas processing, hydrogen production, and synthetic fuel production. In contrast, it is relatively more difficult to capture CO_2 from flue gas emissions, which may require the reengineering of certain established and reliable production techniques. Apart from the technical issues of cleaning such dirty gas streams so they are suitable for CCS, unlike power plants, where CO_2 concentrations are comparatively high and consistent, metallurgical operations have more dilute concentrations of CO_2, the off gas is dirty and difficult to handle, and CO_2 production varies widely depending on the process step.

In summary, CCS is excluded from this BACT evaluation for the following reasons:

- Installation and operate of CCS is not commercially available and has not been installed in conjunction with any SAF process installed and currently operating worldwide;
- Currently there is no infrastructure available at the project site that will allow MS Silicon the ability to capture it's CO_2 gas streams and pipe them to a nearby facility for further processing, such as a beverage plant;
- Currently there is no infrastructure available at the project site that will MS Silicon the ability to capture and store it's CO_2 gas stream for future use in the event a beverage plant would be installed in the vicinity of the proposed plant site;
- CO_2 produced at the proposed plant will require significant enhancements to improve its quality prior to being used by another source to produce a product; and
- Cost estimates are not being provided in support of removing CCS as a cost effective control alternative since EPA has not provided any guidance or established thresholds on what cost, expressed as a dollar per ton would be considered cost excessive.

Because of the various reasons provided above, MS Silicon is eliminating CCS has a viable control option for GHG control based on its 1) not being commercially available and 2) not being shown to be a proven control option that has been demonstrated in actual operation.

Based on the above technical issues, CCS is consequently deemed not technically feasible for controlling GHG emissions from the proposed SAFs.

Step Three – Assessment of Proposed BACT Emission Reduction Options

This step of the Top-Down analysis provides an assessment of the performance and feasibility of the emission reduction options evaluated. MS Silicon is proposing to utilize the newest generation of submerged arc furnace with inherently lower-emitting technologies, including energy efficiency measures. This new generation furnace is designed to more efficiently convert raw materials to the silicon intermediate product. It is almost impossible to evaluate each option defined above and establish a CO_2 percent reduction.

For purposes of this GHG BACT evaluation, MS Silicon has concluded that the new generation furnace is the most effective control at reducing GHG emissions.

Step - Four Evaluate Most Effective Control and Document Results

As discussed above, various emission reduction options (i.e., new generation furnace) are being proposed by MS Silicon that are considered the **Top Level** of emission reduction available for controlling GHG emissions from the production of silicon. Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

Step Five – Select BACT

A detailed review was conducted to determine the emission reduction options incorporated at other submerged arc furnaces. Review of recently permitted GHG sources and the RBLC database did not reveal BACT determinations for submerged arc furnaces.

BACT for GHG emissions from the semi-enclosed submerged arc furnace has been determined to be:

- **Utilization of a new generation furnace with inherently lower-emitting technologies and energy efficiency measures (i.e., semi-enclosed SAF);**
- **CO_2e emission limitation of 381,866 tons/year; and**
- **Good operation and maintenance to improve energy efficiency.**

4.2.4 BACT Analysis for GHG Emissions from Natural Gas Combustion (AA-202)

The following natural gas combustion emission sources are included in this review:

Description	Heat Input (MMBTU/hr)	Heat Input (MMscf/year)	Total GHG Emissions (CO_2e) (tons/year)
Natural Gas fired Ladle Pre-Heaters – 4 Units – 10.0 MMBtu/hr each	40.0	350,00	20,499

Step One – Identify Available GHG Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling GHG emissions from natural gas combustion equipment:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

The application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity from combustion sources. Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions. Since GHG are the direct result of fuel combustion, any improvement in the efficiency of a process heater will reduce fuel use and GHG emissions. While energy efficiency can reduce emissions of all combustion-related emissions, it is a particularly important consideration for GHGs since the use of add-on controls to reduce GHG emissions is not as well advanced as it is for most combustion-derived pollutants.

Approaches for reducing GHG emissions from fossil fuel-fired equipment could include fuel switching or energy efficiency measures. In the case of natural gas-fired equipment, however, fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels commonly used.

Summary of Potentially Applicable GHG Energy Efficiency Measures – Natural Gas Combustion Sources

Control	Removal Effectiveness	Comments
Burner replacement	Replacing old burners with more efficient modern burners can lead to significant energy savings. Energy and cost savings vary widely based on the condition and efficiency of the burners being replaced.	• Energy efficient burners will be installed in the natural gas combustion equipment

Control	Removal Effectiveness	Comments
Boiler process control	Using a combination of CO and oxygen readings, it is possible to optimize the fuel/air mixture for high flame temperature (and thus the best energy efficiency) and lower air pollutant emissions	• Natural gas combustion equipment will optimize the fuel/air mixture for high flame temperature
Reduction of flue gas quantities	Excessive flue gas results from leaks in the boiler and/or in the flue. These leaks can reduce the heat transferred to the steam and increase pumping requirements. However, such leaks are often easily repaired, saving 2 to 5 percent of the energy formerly used by the boiler	• Equipment will be maintained to minimize any leaks
Reduction of excess air	Boilers must be fired with excess air to ensure complete combustion and to reduce the presence of CO in the unburned fuel in exhaust gases. When too much excess air is used to burn fuel, energy is wasted because excessive heat is transferred to the air rather than to the steam.	• Equipment will be maintained to ensure complete combustion
Carbon Capture and Storage	Carbon capture and storage involves separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 via pipeline, and finally injection and long-term geologic storage of the captured CO_2. Several different technologies, at varying stages of development, have the potential to separate and capture CO_2. Some have been demonstrated at the slip-stream or pilot-scale, while many others are still at the bench-top or laboratory stage of development	See below.

Step Two – Eliminate Technically Infeasible Control Options

With the exception of carbon capture and sequestration (CCS), all of the control options identified under Step 1 are technically feasible and will be included in this BACT evaluation. CCS was not evaluated in this BACT evaluation. This type of control technology has not been applied to natural gas combustion

sources in the past and has not been demonstrated in practice for these emission types. CCS is generally used for facilities with sources emitting CO_2 in large amounts, such as fossil fuel-fired power plants, and for industrial facilities with high-purity CO_2 streams. Based on this, CCS is consequently deemed not technically feasible for controlling the GHG emissions from the natural gas combustion sources that will support the proposed plant operations.

Thus, the available control options are as follows:

- Combustion of clean-burning fuel - Burners are designed to combust natural gas. Fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels commonly used;
- Energy efficiency pollution prevention options that are available for this type of combustion device include the following:
    - Burner efficiency;
    - Preventive Maintenance; and
    - Energy monitoring and management systems.

Step Three – Assessment of Proposed BACT Emission Reduction Options

This step of the Top-Down analysis provides an assessment of the performance and feasibility of the emission reduction options evaluated. Combustion of natural gas, low NO_x burners and good combustion practices and maintenance to improve energy efficiency are considered the top level of emission reduction available for the natural gas combustion equipment.

Step Four - Evaluate Most Effective Control and Document Results

The emission reduction options that are being proposed by MS Silicon that are considered the **Top Level** of emission reduction available for controlling GHG emissions from the combustion of natural gas. Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

Step Five - Select BACT

A detailed review was conducted to determine the emission reduction options incorporated at other natural gas fired burners. Review of the RACT/BACT/LAER Clearinghouse (RBLC) revealed the following BACT determinations for natural gas combustion equipment.

Facility/ RBLC ID	Permit Date	Basis	Process	GHG BACT Limit	Controls
Cargill, Inc. NE-0054 DRAFT DETERMINATION	3/1/13	BACT-PSD	300 MMBtu/hr Boiler	No Limit	Good combustion practice
Iowa Fertilizer Company IA-0105	10/26/12	BACT-PSD	472.4 MMBtu/hr Auxiliary Boiler	CO_2:117 lb/MMBtu Methane:0.0023 lb/MMBtu N_2O: 0.0006 lb/MMBtu	Good combustion practice
Iowa Fertilizer Company IA-0105	10/26/12	BACT-PSD	110.12 MMBtu/hr Startup Heater	CO_2:117 lb/MMBtu Methane:0.0023 lb/MMBtu N_2O: 0.0006 lb/MMBtu	Good combustion practice
Showa Denko Carbon, Inc. SC-0142	6/8/12	BACT-PSD	5 MMBtu natural gas fired hot oil heater	CO_2e: 3093 tpy	Good combustion practice, annual tune-up low NO_x burner
Port Dolphin Energy LLC FL-0330	12/1/11	BACT-PSD	Four 278 MMBtu/hr boilers	CO_2:117 lb/MMBtu	tuning, optimization, instrumentation and controls, insulation, and turbulent flow
Pyramax Ceramics, LLC GA-0147	2/8/12	BACT-PSD	9.8 MMBtu/hr natural gas fired boiler	CO_2e: 5809 tpy rolling average	Good Combustion Practices, design, and thermal insulation
Entergy Louisiana LLC, Nine Mile Point Electric Generating Plant LA-0254	08/16/11	BACT-PSD	Auxiliary Boiler 338 MMBtu/hr	CO_2:117 lb/MMBtu Methane:0.0022 lb/MMBtu N_2O: 0.0002 lb/MMBtu	Proper operation and good combustion practices

Summary of Potentially Applicable GHG Energy Efficiency Measures – Natural Gas Combustion Equipment

Control	Description	Comments
Use of Low Carbon Fuels	Burners will be combusting natural gas	• Burners are designed to combust natural gas. Fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels

Control	Description	Comments
Energy efficient processes and technologies	• Low NOx burners, • Good combustion practices to improve energy efficiency • Good maintenance of combustion equipment	• Burner design will incorporate low NOx burners and good combustion practices and maintenance to improve energy efficiency

Based on information reviewed for this BACT analysis, the GHG control measures focus on fuel type or energy efficiency measures. No other applicable GHG control measures were identified in this review. Provided below is a summary of the emission reduction options being incorporated into the natural gas fired combustion devices associated with the proposed silicon plant. Rationale for selection of BACT includes the use of natural gas as a clean burning fuel, use of low NO_x energy efficient burner technology and good combustion practice.

BACT for this emission unit is as follows:

- CO_2 – 117 lb/MMBtu
- Methane – 0.0022 lb/MMBtu
- N_2O – 0.0002 lb/MMBtu

Control techniques to be implemented to meet these emission limitations will be: 1) good combustion practices, 2) combustion of natural gas only, 3) selection of the most energy efficient burner design based on engineering selection process and 4) periodic maintenance.

4.3 Best Available Control Technology (BACT) Analysis - Emissions of $PM_{10}/PM_{2.5}$

Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. Particulate matter exists in the solid and liquid physical states, and gases or vapors may also condense to form particulate matter. The latter, condensable particulate matter, is of great concern due to the inherently small size of condensation products; overwhelmingly, condensable particulate can be classified as $PM_{2.5}$[3]. $PM_{2.5}$ is defined as particulate matter that has a diameter of 2.5 microns or less and is a subset of PM_{10} which is particulate with a size range of 10 microns or less. Even though both are particulate matter they have separate air quality standards and are considered separate pollutants for permitting purposes. The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:

- "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.[4]

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for the proposed silicon production plant. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of $PM_{10}/PM_{2.5}$ will be controlled to the levels specified. Condensable $PM_{2.5}$ emissions occur when gas molecules are present in the exhaust gas stream that when cooled change into a particulate state. This change from gas vapor to solid is referred to as condensable particulates. USEPA is involved in extensive research on trying to better define this change over, as well as how best to quantify the presence of these condensable particulates. For purposes of this evaluation, since no specific technologies exist (i.e., commercially available and demonstrated), above and beyond that already selected in the form of a baghouse, for controlling $PM_{2.5}$ emissions, additional emphasize was

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[3] Condensable Particulate Matter, Regulatory History and Proposed Policy, January 27, 1998 http://www.ncair.org/enf/sourcetest/cpm/condensweb.pdf

[4] http://www.epa.gov/air/particlepollution/

placed on the availability of controls to reduce emissions of SO_2 and NO_x. Emissions of SO_2 and NO_x can be present in the gas phase that could convert to solids in the form of sulfates and nitrates. USEPA has identified SO_2 and NO_x as potential precursors to the formation of $PM_{2.5}$ emissions. However, USEPA has not provided, as of the date of this application, guidance on the effect of SO_2 and NO_x as potential precursors to the formation of $PM_{2.5}$ emissions. Subsequently, evaluation of the control options to reduce SO_2 and NO_x emissions to further reduce $PM_{2.5}$ emissions have not been included in this BACT evaluation.

4.3.1 $PM_{10}/PM_{2.5}$ Emission Sources Subject to Control Technology Evaluation

The $PM_{10}/PM_{2.5}$ emission sources associated with the proposed plant that are included in this $PM_{10}/PM_{2.5}$ BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces (SAFs) (AA-201);
- Casting Frames (AA-201a);
- Silica Fume Silos (AA-404);
- Natural Gas Fired Combustion Equipment (AA-202);
- Diesel Fired Emergency Generator (AA-501);
- Material storage and handling (AA-101, AA-101a, AA-102, AA-102a, AA-103, AA-103a, AA-104, AA-105, AA-106);
- Wood Chipper (AA-102b); and
- Roadways (AA-401, AA-402a).

For a summary of the estimated $PM_{10}/PM_{2.5}$ emission rates for the sources identified above, please refer to the following table:

$PM_{10}/PM_{2.5}$Emission Rates for Sources Evaluated for BACT

Equipment Description	PM_{10} Emission Rate (tons/year)	$PM_{2.5}$ Emission Rate (tons/year)
AA-201 - Semi-Enclosed Submerged Arc Furnaces (SAFs)	61.2	61.2
AA-201a- Casting Frames	0.3	0.3
AA-202 - Natural Gas Fired Ladle Preheaters	0.1	0.1
Diesel Fired Emergency Generator (AA-501)	0.001	0.001

Equipment Description	PM_{10} Emission Rate (tons/year)	$PM_{2.5}$ Emission Rate (tons/year)
Material Handling and Storage:		
• Material Transfer to and from Coal Storage Pile (AA-101)	0.01	0.002
• Material Transfer to and from Wood Storage Pile (AA-102)	0.002	0.0003
• Material Transfer to and from Quartz Storage Pile (AA-103)	1.8	0.3
• Limestone Material Handling (AA-104)	0.0008	0.0001
• Material Handling Area Baghouse (AA-101a, AA-102a, AA-103a)	6.8	6.8
• Product Handling Area Baghouse (AA-301)	3.4	3.4
• Storage Piles Processing (i.e., Bulldozing) (AA-105)	1.7	0.2
• Storage Piles Wind Erosion (AA-106, AA-403)	2.5	0.4
• Silica Fume Silos (AA-404)	0.15	0.15
AA-102b - Wood Chipper	0.042	0.042
AA-402 - In-Plant Gravel Roads	3.7	0.37
AA-402a - In-Plant Paved Roads	0.3	0.3
Total	**81.8**	**73.3**

4.3.2 BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Semi-Enclosed Submerged Arc Furnaces

Step One - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling $PM_{10}/PM_{2.5}$ emissions from plant operations:

1. On-line USEPA Control Technology Database; and
2. State Air Quality Permits;

Particulate control technologies exist today that are proven and reliable that that provide a high level of removal efficiency (i.e., in excess of 99%). These technologies are well suited for controlling particulate matter, including $PM_{2.5}$ in the form of solids or "filterable" particulates. As will be described in the BACT evaluation that follows, MS Silicon is installing a fabric filter bag-house which is considered the top level of $PM_{10}/PM_{2.5}$ control technology for filterable particulates from the semi-enclosed submerged arc furnace. MS Silicon will also be using Best Management Practices to minimize the generation of $PM_{10}/PM_{2.5}$ fugitive emissions.

Technologies will continue to emerge for controlling particulate matter emissions, including $PM_{2.5}$ that are in the vapor phase in the exhaust gas and when cooled by ambient air at the point of the exhaust stack release, change from a vapor phase to a solid phase. This change over is defined as "condensable" particulates. As part of the BACT evaluation that follows we have examined proven technologies that can further reduce these precursors, thus reducing the condensable portion of $PM_{2.5}$ from the exhaust gas stream. Condensable $PM_{2.5}$ emissions should be minimal from the fugitive sources.

The choice of which technology is most appropriate for a specific application depends upon several factors, including particle size to be collected, particle loading, stack gas flow rate, stack gas physical characteristics (e.g., temperature, moisture content, presence of reactive materials), and desired collection efficiency. Emissions of particulate matter are generally controlled with add-on control equipment designed to capture the emissions prior to the time they are exhausted to the atmosphere. In cases where the material being emitted is organic, particulate matter may be controlled through a combustion process. The following control technologies were identified and evaluated to control $PM_{10}/PM_{2.5}$ emissions from the SAF:

(a) Electrostatic Precipitator (ESP) - In an ESP, particles are electrically charged and then exposed to an electric field in which they are attracted to an electrode. Periodically, this electrode is cleaned through vibration and the freed particles are directed into a collection unit. While ESPs have been used on solid fuel combustion devices they have not been used on similar sources as the proposed plant

(b) High Efficiency Cyclones - Cyclones and multicyclones are a commonly used PM control technology in the United States. A cyclone removes particles based the principle of gravity and centrifugal force. A multicyclone uses the same concept as a cyclone but employs multiple, smaller diameter cyclones to improve its capturing capacity. The particle control efficiency of both devices decreases as the particle size decreases and therefore do not adequately control $PM_{2.5}$.

(c) High Energy Scrubbers – High energy scrubbers are a wet scrubbing system that combines a high energy venturi scrubber with a cyclonic separator. These scrubbers are effective in the removal of dusts, fumes, vapors, and mists; as well as a variety of other air pollutants, and

(d) Fabric Filters (i.e., baghouses) - Fabric filters have been widely used for controlling PM emissions from many different types of sources. Large industrial, commercial, and Institutional (ICI) boilers are equipped with these devices and have PM control efficiencies of 99 percent or higher. A fabric filter, or baghouse, is made up of cloth or woven specialty fibers. The flue gases are directed through the filter. The separation efficiency of bag filters is quite high. Because of their design (large surface area of bags and longer residence times in transit), fabric filters may capture a higher fraction of ultrafine particles than ESPs

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull air from the SAF and push the dust laden air through the fabric filters and into the ambient air via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from SAF operations application due to their effectiveness. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to electric arc furnaces at silicon production plants:

Facility/	Permit Date	Process	PM_{10} Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	PM: 21.3 lb/hr per furnace (based on process weight rate calculation	Fabric filter (baghouse)

Facility/	Permit Date	Process	PM_{10} Limit	Add-On Controls
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	0.99 lb/MW-hr 6.2 lb/hr	Baghouse
West Virginia Alloy, Inc. Alloy, West Virginia R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	PM10: 22.71 lb/hr	Baghouse with >99% control
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	0.03 gr/dscf (filterable) or no visible particulate emissions, whichever is less stringent	Open roof Baghouse

As shown in the above table, PM emissions from submerged electric arc furnaces are controlled exclusively by baghouses and the BACT emission limits vary in how they are expressed. Because of the variations in the plant operations, it is very difficult to identify a consistent BACT emission limitation or permit limitation. For the $PM_{10}/PM_{2.5}$ emission sources associated with the SAFs at the proposed plant, a baghouse was the only control methods evaluated. The proposed BACT limit is at least as stringent as the permit limits presented in the table above.

Thus, BACT for $PM_{10}/PM_{2.5}$ emissions from the semi-enclosed submerged arc furnaces at the proposed plant is as follows:

- **Use of fabric filter control (i.e., baghouse); and**
- **$PM_{10}/PM_{2.5}$ – 0.005 grains per dry standard cubic foot (gr/dscf).**

4.3.3 BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Casting Frames (AA-201a)

Molten product from the SAFs will be poured into low, flat pans that will provide rapid cooling and solidification of the molten metal. There is a potential for fume and dust to be generated during the casting process, however the amount of actual dust should be minimal.

Step One - Identify Available $PM/PM_{10}/PM_{2.5}$ Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. Potential PM control technologies are identified in the previous section.

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM/PM_{10}/PM_{2.5}$ emissions from the casting operations. The exhausting of casting emissions from a central canopy positioned over the casting installations to the SAF baghouse is neither practical nor economically feasible since it is too far away. In addition, the casting frame emissions in question are very low (< 1.0 tons/year) and can also be further minimized by the manner with which the unit is operated. The potential PM emissions are small and installation of a canopy and exhaust dust system is not very effective at capturing these small quantities of PM emissions. Thus, add-on controls are eliminated from further consideration in this BACT evaluation.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control option is best management practices.

Step 4 – Evaluate the Most Effective Controls and Document Results

Best management practices are the only effective control for this type of emission source.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for casting operations associated with the silicon production operations. Review of state permit information also did not identify BACT determinations for casting operations associated with the silicon production operations.

MS Silicon will be using Best Management Practices to minimize the generation of $PM/PM_{10}/PM_{2.5}$ fugitive emissions from the casting frame operation.

BACT for $PM/PM_{10}/PM_{2.5}$ for the casting frames (AA-201a) is proposed as:

- Best Management Practices to minimize the generation of $PM/PM_{10}/PM_{2.5}$ fugitive emissions from the casting frame operation; and
- No emission limit is being proposed since there is no formal method for quantifying emissions from this type of indoor operation.

4.3.4 BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Natural Gas Combustion (AA-202)

Because natural gas is a gaseous fuel, filterable PM emissions from combustion are typically low. Particulate matter from natural gas combustion has been estimated to be less than 1 micrometer in size and has filterable and condensable fractions. Particulate matter from natural gas combustion is usually

larger molecular weight hydrocarbons that are not fully combusted. Increased PM emissions may result from poor air/fuel mixing or maintenance problems[5].

Natural Gas Combustion Sources – Includes the following:

- AA-202: Ladle Pre-Heaters (Four 10 MMBtu/hr): 0.1 tpy $PM_{10}/PM_{2.5}$;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from small natural gas combustion units. See below table for summary of $PM_{10}/PM_{2.5}$ BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	PM_{10} BACT Limit	$PM_{2.5}$ BACT Limit	Add-On Controls
SeverCorr LLC Columbus, Mississippi	07/15/11	BACT-PSD	Ladle preheaters, ladle dry-out heaters, Tundish preheaters, Tundish dry-out heaters, vertical ladle holding station, annealing furnaces, vacuum degasser boiler, boilers	None	None	Combustion of natural gas only
Nucor Steel, AR Blytheville, AR	06/10/11	BACT-PSD	Pickle Line Boilers, natural gas fired burners and dryers, ladle dryers	0.0076 lb/MMBtu	None	None
Sasol North America LA-0244	11/29/10	BACT-PSD	87.30 MMBtu/hr charge Heater	Total PM_{10}: 0.01 lb/MMBtu	-	No controls
Sasol North America LA-0244	11/29/10	BACT-PSD	21.00 MMBtu/hr startup Heater	Total PM_{10}: 0.01 lb/MMBtu	-	No controls

[5] AP 42, Fifth Edition, Volume I, Chapter 1.4: External Combustion Sources Natural Gas Combustion, July 1998

Facility/ RBLC ID	Permit Date	Basis	Process	PM_{10} BACT Limit	$PM_{2.5}$ BACT Limit	Add-On Controls
Lake Charles Cogeneration LLC LA-0231	06/22/09	BACT-PSD	34.20 MMBtu/hr Shift Reactor Startup Heater	Total PM_{10}: 0.007 lb/MMBtu	-	Good design and proper operations
Competitive Power Ventures MD-0040	11/12/08	BACT-PSD	1.70 MMBtu/hr Heater	Filterable PM_{10}: 0.0070 lb/MMBtu	Filterable 0.0070 lb/MMBtu (LAER)	No controls
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	Ladle Preheater and refractory drying	0.0076 lb/MMBtu (total)	-	Combustion of natural gas
Thysenkrupp Steel and Stainless USA, LLC AL-0230	08/17/07	BACT PSD	33.40 MMBtu/hr Batch Annealing Furnaces	0.0076 lb/MMBtu	-	No controls
Nucor Decatur, LLC AL-0231	06/12/07	BACT-PSD	98.7 MMBtu/hr Galvanizing Furnace	PM: 0.0076 lb/MMBtu	-	No control
Republic Engineered Products, Inc OH-0303	08/30/05	LAER	Ladle Dryers/Preheaters	7.6 lb/mmscf (filterable)	7.6 lb/mmscf (filterable)	Good combustion control with proper natural gas burner design, no add-on controls
6Nucor Steel IN-0090	01/19/01	BACT-PSD	Ladle Preheaters	-	-	Combustion of natural gas or propane
Arkansas Steel Associates AR-0044	01/05/01	BACT-PSD	Ladle Preheaters	0.20 lb/hr (filterable)	-	Natural gas combustion/ Good combustion practices

As shown in the above table, no add-on controls are used for $PM_{10}/PM_{2.5}$ from the natural gas combustion equipment.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling PM emissions. No similar sized natural gas combustion devices were identified add-on PM controls as BACT.

Thus, BACT is defined as combustion of clean fuel and good combustion practices. For the natural gas combustion sources associated with the proposed Plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of PM control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

BACT for the natural gas combustion devices is as follows:

- **Combustion of natural gas; and**
- **Good operating practices.**

4.3.5 BACT Analysis for $PM_{10}/PM_{2.5}$ from Material Storage and Handling (AA-101, AA-101a, AA-102, AA-102a, AA-103, AA-103a, AA-104, AA-301)

Raw materials will be received by truck at the site. The primary materials to be handled and stored at the silicon production plant are as follows:

- Coal;
- Wood;
- Limestone and
- Quartz.

Upon receipt the raw materials will be unloaded, conveyed and stored in outside piles. The raw materials will then be transferred via front end loaders to day bins in the submerged arc furnace building.

Add on control devices such as a baghouse or wet suppression will minimize particulate emission rates from material storage and handling. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Baghouses typically achieve PM control efficiencies of greater than 99%.

Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50-70%.

AA-101: Material Transfer to and from Coal Storage Pile

Coal will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of coal.

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Review of the RBLC database and recent permit applications indicated that viable PM controls for coal transfer to and from storage piles is a fugitive dust control plan (windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions as required). Refer to table below for a listing of recent BACT determinations for coal receiving and handling operations.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.

- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.

- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The table below lists the proposed particulate BACT determination, along with the existing particulate BACT determinations, for coal receiving and handling and coal transferring. All data in the table is based on the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

The limits being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for coal handling operations at these facilities.

Existing PM/PM_{10}/$PM_{2.5}$ BACT Limits - Material Transfer to and from Coal Storage Pile

Facility	Date	Basis	Source	PM_{10}/$PM_{2.5}$ BACT Limit	BACT Control Method
East Kentucky Power Cooperative KY-0100	4/9/10	BACT-PSD	Coal Stockpile and unloading	PM: 10% opacity 3-minute	Wet suppression, dust suppressant, lowering well and compaction
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Coal storage piles	PM_{10}: 12.3 tpy rolling 12-month period	3-Sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
Martin Marietta Magnesia Specialties OH-0321	11/13/08	BACT-PSD	Coal and coke material handling	PM_{10}: 0.95 tpy rolling 12-month period	Building enclosure and high moisture content coal and coke >5%
Homeland Energy Solutions, LLC IA-0089	08/28/07	BACT-PSD	Coal receiving and handling	Filterable PM_{10}: 0.005 gr/dscf	Use of baghouse and water fogging. (Baghouse used to control storage bins and water fogging used to eliminate PM in unloading area
University of Northern Iowa IA-0086	5/3/07	BACT-PSD	Coal pile receiving and reclaim	Filterable PM_{10}: 095% control	Dust suppressant

Step 5 - Select BACT

BACT for the Material Transfer to and from Coal Storage Pile (AA-101) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate

Material Transfer to and from – Wood Storage Pile (AA-102)

Wood will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of this material. Since these operations will have the potential to emit minor levels (due to the inherent moisture content of the wood to be handled and stored) of $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of a fugitive type release, typical PM control technologies are not appropriate for these types of operations. The types of control measures used for materials handling operations can be classified as best management practices and include inherent pollution control techniques (covered conveyors, partially enclosed conveyor drop points, minimization of pile drop discharge distance, etc.).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Review of the RBLC database and recent permit applications indicated that viable PM controls for wood transfer to and from storage piles is a fugitive dust control plan (windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions as required). Refer to table below for a listing of recent BACT determinations for wood receiving and handling operations.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.
- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.
- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The table below lists the proposed particulate BACT determination, along with the existing particulate BACT determinations, for wood pile receiving, handling, and transferring. All data in the table is based on the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

The limits being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for wood handling operations at these facilities.

Existing $PM/PM_{10}/PM_{2.5}$ BACT Limits – Wood Storage and Handling

Facility	Date	Basis	Source	$PM_{10}/PM_{2.5}$ BACT Limit	BACT Control Method
Southeast Regional Fuels, LLC FL-0322	12/23/10	BACT-PSD	Biomass material handling and preparation	5% opacity	To minimize fugitive, PM_{10} and $PM_{2.5}$, biomass conveyors shall be enclosed. Where required to meet the 5 % opacity requirement, the permittee shall install dust collectors on the conveyor transfer and drop points. The dust collectors shall be designed to obtain an outlet PM loading of 0.005 grains per dry standard cubic foot (gr/dscf). Additional practices: Enclosing material drop points, transfer points, shredders and screens wherever practical; Contouring storage piles to minimize wind erosion; Utilizing water sprays on storage piles as needed;

Facility	Date	Basis	Source	$PM_{10}/PM_{2.5}$ BACT Limit	BACT Control Method
Georgia Power Co. GA-0140	12/03/10	BACT-PSD	Biomass storage and handling	-	Partial enclosures for the conveyors; Partial enclosures for the transfer points
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Biomass Storage Piles	AP-42 Calculation: 1.0 tpy fugitive PM_{10} No visible emissions except for 13-min in any 60-min period	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
Weyerhauser Co. LA-0201	05/24/06	BACT-PSD	Chip Handling	Filterable PM_{10} 0.0001 lb/T	Covered conveyors
Kingsford Manufacturing Company MS-0081	09/09/05	BACT-PSD	Wood Receipt	Filterable PM_{10}: 0.0020 lb/T wood	Good work practice standards and partial enclosure of truck dump area
			Wood Storage	Filterable PM_{10}: 0.0065 lb/T wood	Good work practice standards

The above table presents BACT limits for $PM_{10}/PM_{2.5}$ emissions from wood/biomass material handling operations. The limit being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for other material handling operations at other types of facilities.

Review of state permits for similar operations (i.e., ferroalloy operations) revealed the following:

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009 Date: 11/26/10	Raw Material Handling - Raw Material Transfer and Storage operations begin with the receipt of raw materials via truck or rail. Coal, coke, charcoal, gravel, woodchips, and turnings are unloaded via crane to piles or directly to a below grade conveyor or pit. Coal is transferred to the pit, from which it is conveyed up to enclosed raw material storage bins or unloaded to outdoor storage piles. Gravel is unloaded to piles, transported by crane to a conveyor, screened, and conveyed up to enclosed storage bins. Wood chips are dumped from a trailer to the pit and transported up to enclosed storage bins. From indoor bins, the raw materials are weighed and dropped to a skip bucket from which they are transferred to the top of the furnace.	No limit	Enclosed storage bins
Globe Metallurgical Selma, AL 104-0001 Date: 9/10/10	Product Handling – Raw material receiving, transfer and storage	Process weight rate limitation 20% opacity in one 6-minute average in any 60 minute period	No add-on controls
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006 Date: 01/18/06	Raw material storage piles	No limit	None
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105 Date: 10/24/01	Raw material unloading and handling	20% opacity as a 3-minute average	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
	Raw Material and Waste Storage Piles – Load in or load out, wind erosion	No visible particulate emissions except for 13 minutes during any 60-minute period	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust

Step 5 -Select BACT

BACT for the wood material handling operations (AA-102) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate

Material Transfer to and from Quartz/Limestone Storage Piles (AA-103, AA-104)

Quartz and limestone will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of these materials. Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of a fugitive type release, typical PM control technologies are not appropriate for these types of operations. The types of control measures used for materials handling operations can be classified as best management practices and include inherent pollution control techniques (covered conveyors, partially enclosed conveyor drop points, minimization of pile drop discharge distance, etc.).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by

combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.

- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.
- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.
- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

Review of the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC) did not identify quartz handling and storage operations.

Review of state permits for similar operations (i.e., ferroalloy operations) revealed the following:

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009 Date: 11/26/10	Raw Material Handling - Raw Material Transfer and Storage operations begin with the receipt of raw materials via truck or rail. Coal, coke, charcoal, gravel, woodchips, and turnings are unloaded via crane to piles or directly to a below grade conveyor or pit. Coal is transferred to the pit, from which it is conveyed up to enclosed raw material storage bins or unloaded to outdoor storage piles. Gravel is unloaded to piles, transported by crane to a conveyor, screened, and conveyed up to enclosed storage bins. Wood chips are dumped from a trailer to the pit and transported up to enclosed storage bins. From indoor bins, the raw materials are weighed and dropped to a skip bucket from which they are transferred to the top of the furnace.	No limit	Enclosed storage bins
Globe Metallurgical Selma, AL 104-0001 Date: 9/10/10	Product Handling – Raw material receiving, transfer and storage	Process weight rate limitation 20% opacity in one 6-minute average in any 60 minute period	No add-on controls
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006 Date: 01/18/06	Raw material storage piles	No limit	None

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105 Date: 10/24/01	Raw material unloading and handling	20% opacity as a 3-minute average	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust
	Raw Material and Waste Storage Piles – Load in or load out, wind erosion	No visible particulate emissions except for 13 minutes during any 60-minute period	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust

The limit being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for other material handling operations at other types of facilities.

Step 5 -Select BACT

BACT for the quartz and limestone storage pile handling operations (AA-103, AA-104) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for these operations since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

Material Handling (Coal, Wood, Quartz) Baghouse (AA-101a, AA-102a, AA-103a) and Product Handling Area Baghouse (AA-301 and AA-403)

Material from the storage piles will be conveyed via front end loaders to enclosed day bins. From the day bins, the raw materials will be weighed and dropped to a skip bucket from which they will be transferred to the top of one (1) of four (4) semi-enclosed submerged arc furnaces for processing.

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of point source release, these emission can be controlled using the particulate matter controls described in previous sections of this document.

Step 2 - Elimination of Technically Infeasible $PM_{10}/PM_{2.5}$ Control Alternatives

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull

air from the SAF and push the dust laden air through the fabric filters and into the ambient air via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from material handling operations due to their effectiveness. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 -Select BACT

BACT for the raw material and product handling operations (AA-101a, AA-102a, AA-103a, AA-301, AA-403) is proposed as the following:

- Baghouse for PM control; and
- A $PM_{10}/PM_{2.5}$ limitation of 0.003 gr/dscf.

It should be noted that MS Silicon is voluntarily designing the baghouse to meet 0.0015 gr/dscf to minimize the potential impact on $PM_{10}/PM_{2.5}$ air quality. This emission rate does not constitute BACT.

4.3.6 BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Silica Fume Silos (AA-404)

Silica fumes collected in the SAF baghouses will be pneumatically transferred to the silica fume silos. In the silos, the silica fumes will be densified to about 45 lbs/cu.ft., prior to dispatch to cement and refractory manufacturers that can use this dust in their other operations (i.e., cement and refractory).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of point source release, these emission can be controlled using the particulate matter controls described in previous sections of this document.

Step 2 - Elimination of Technically Infeasible $PM_{10}/PM_{2.5}$ Control Alternatives

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull air from the SAF and push the dust laden air through the fabric filters and into the ambient air via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from these operations. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 -Select BACT

BACT for the silica fume silos (AA-404) is proposed as the following:

- Bin vent filter for PM control; and
- A $PM_{10}/PM_{2.5}$ limitation of 0.01 gr/dscf.

4.3.7 BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Emergency Equipment (AA-501)

The emergency equipment includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP): 0.001 tpy $PM_{10}/PM_{2.5}$.

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from emergency generators. See below table for summary of PM BACT determinations from the RBLC database.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

The emergency diesel fired generator associated with the proposed project will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. The projected annual $PM_{10}/PM_{2.5}$ emissions rate is 0.001 tpy. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of $PM_{10}/PM_{2.5}$ emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control $PM_{10}/PM_{2.5}$ emissions from the emergency equipment, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing $PM_{10}/PM_{2.5}$ BACT determinations for diesel fired emergency equipment. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	$PM_{10}/PM_{2.5}$ BACT Limit	Add-On Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	Total PM: 0.2 g/KW-H	No controls The emergency generators shall comply with the emission limit and demonstrate compliance in accordance with the procedures given in NSPS 40 CFR 60, Subpart IIII.
		Emergency ULSD Fire Pump (One 600 HP)	Total PM: 0.15-g/HP-hr	No controls The fire pumps shall comply with the emission limit and demonstrate compliance in accordance with the procedures given in NSPS 40 CFR 60, Subpart IIII.
Idaho Power Company ID-0018	6/25/10	750 KW Emergency Diesel Generator	PM: 0.2 g/KW-H -H	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389	12/29/09	2000 KW Emergency ULSD Generator	Total PM: 0.2 g/KW-H Total PM_{10}: 0.0573 g/KW-H	Engine design and operation, 15 ppm sulfur fuel Operational Limits: 1 hr/day, 500 hrs/yr for $PM_{2.5}$ NAAQS
Verenium (FL-0318)	12/10/09	2000 KW Emergency generators	Total PM: 0.2 g/KW-H	None

Facility/ RBLC ID	Permit Date	Process	$PM_{10}/PM_{2.5}$ BACT Limit	Add-On Controls
		Emergency ULSD Fired Pump	Total PM: 0.15-g/HP-hr	The fire pump engine is an Emergency Stationary Compression Ignition Internal Combustion Engine (Stationary ICE) and shall comply with applicable provisions of 40 CFR 60, Subpart IIII
Lake Charles Cogeneration, LLC (LA-0231)	06/22/09	Emergency Diesel Power Generator Engines (1341 HP)	Total PM_{10} 0.06 lb/h	Comply with 40 CFR 60 Subpart IIII
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, ULSD fuel, limited to 100 hours of operation per year
		500 KW emergency generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, ULSD fuel, limited to 100 hours of operation per year
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	Total PM_{10}: 0.2 g/KW-H	None
		267 HP low sulfur diesel emergency fir pump	Total PM_{10}: 0.4 G/HP-H	

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII and good combustion/operating practices.

Step 5 – Select BACT for $PM_{10}/PM_{2.5}$ from Emergency Equipment

BACT is proposed as compliance with NSPS IIII and good combustion/operating practices.

4.3.8 BACT analysis for $PM_{10}/PM_{2.5}$ Emissions from Wood Chipper (AA-102b)

The portable electric wood chipper will be used for as needed wood grinding/chipping and will be limited to 2080 hours per year of operation. Fugitive particulate emissions can occur from operation of the wood

chipper (AA-102b). The wood chipper operation design will include an enclosure that will minimize fugitive dust emissions.

Step 1 – Identify Control Options

Due to the limited hours of operation and the fugitive nature of the operation, there are no control options that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from wood chippers.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

No wood chippers were identified in the RBLC database. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank the Remaining Control Technologies

The only remaining technically feasible method for control of particulate emissions resulting from operation of the wood chipper is an enclosure that will minimize fugitive dust emissions and limited hours of operation. The combination of these control methods represents the Top-Rated control.

Step 4- Evaluate the Most Effective Control

Since there are no other feasible technologies available that could achieve the same level of PM control as that being proposed for the wood chipper, equipment, economic, energy, and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

Step 5 - Select BACT

The following has been proposed as BACT for controlling PM emissions from the wood chipper:

- Operation of the wood chipper with an enclosure or similar that will minimize fugitive dust emissions;
- Limited hours of operation for the wood chipper; and
- No emission limit is being proposed for this operation since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

4.3.9 BACT analysis for $PM_{10}/PM_{2.5}$ Emissions from Bulldozer Storage Pile Processing (AA-105)

Bulldozers will be used to groom and maintain the storage piles. The emissions from these operations are fugitive in nature.

Step 1 – Identify Control Options

Due to the fugitive nature of the operation, there are no add-on control options that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from bulldozing the storage piles. Review of the RBLC database and other silicon plant permits did not identify similar operations.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

Based on the nature of the operation, the only viable controls are the use of best management practices (i.e., dust minimization techniques including as needed water spray application and wind screens).

Step 3 - Rank the Remaining Control Technologies

The only remaining technically feasible method for control of particulate emissions resulting from bulldozing operations on the storage piles is the use of best management practices (i.e., dust minimization techniques including as needed water spray application and wind screens). The combination of these control methods represents the Top-Rated control.

Step 4- Evaluate the Most Effective Control

Since there are no other feasible technologies available that could achieve the same level of PM control as that being proposed for the storage pile processing operations, equipment, economic, energy, and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

Step 5 - Select BACT

The following has been proposed as BACT for controlling PM emissions from the storage pile processing (AA-105):

The proposed BACT for storage pile processing (bulldozing) associated with this project is:

- The development of a dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, wind screens and speed reduction, as required; and
- No emission limit is being proposed for this operation since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

4.3.10 BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Storage Pile Wind Erosion (AA-106)

PM emissions may be generated by wind erosion from the storage piles. Because the material stored will be fairly heavy and will not consist of a fine dust-like material, potential emissions should be minimal.

Step 1 - Identification of Available $PM/PM_{10}/PM_{2.5}$ Controls

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air

pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.

- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Step 2 - Elimination of Technically Infeasible $PM/PM_{10}/PM_{2.5}$ Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.

- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.

- Implementation of fugitive dust control plan: >50% control efficiency

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis and the implementation of a fugitive dust control plan.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The following table lists existing particulate BACT determinations, for material storage pile operations. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Material Storage Areas					
Facility	**Date**	**Basis**	**Source**	**$PM/PM_{10}/PM_{2.5}$ BACT Limit**	**BACT Control Method**
Nucor Steel OH-0341	12/23/10	BACT-PSD	Scrap steel storage piles	Fugitive PM - 0.43 ton/yr Fugitive PM_{10} - 0.22 ton/yr Fugitive $PM_{2.5}$ - 0.06 ton/yr	Minimize drop height
Consolidated Environmental Management – Nucor Steel LA-0239	5/24/10	BACT-PSD	Coal Storage Pile	Total PM - 3.99 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
			Slag processing storage piles	Total PM - 1.19 ton/yr	BACT is selected to be wet suppression of dust generating sources by water sprays
			Iron Ore Pellet storage piles	Filterable PM - 13.88 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
			Flux storage piles	Filterable PM - 2.18 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
			Granulated slag storage piles	Filterable PM - 2.18 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
Osceola Steel Company, Georgia	3/15/10	BACT-PSD	Slag storage piles	No Emission limit	The control method is source control, either through minimizing drop height or wet suppression of the material. In addition, roadways and stockpiles of slag to be processed will also be treated by wet suppression

Material Storage Areas					
Facility	**Date**	**Basis**	**Source**	**$PM/PM_{10}/PM_{2.5}$ BACT Limit**	**BACT Control Method**
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Coal Storage Piles	Fugitive PM - 12.3 tpy PM_{10}	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
			Biomass Storage Piles	Fugitive PM - 2.7 tpy PM_{10}	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
			Slag storage piles	Fugitive PM 1.6 ton/yr from wind 11.7 ton/yr load out	Use of water trucks or fire hoses to maintain high moisture content. Water applied for load out. Minimize free fall distances. Haul trucks covered.
Nucor Steel, Indiana	6/1/12	BACT-PSD	Slag Storage	Opacity limits: Stockpiling of slag adjacent to the grizzly feeder = 3 % Wind erosion of stockpiles = 3% Continuous stacking of processed slag to stockpiles = 3%	Fugitive Dust Control Plan

Step 5 -Select BACT

Proposed BACT for Material Storage Pile Operations (AA-106):

- Implementation of a fugitive dust control plan. Visible emissions from the storage piles shall be controlled by the application of water, other dust suppressants or the use of wind screens, as needed.

- No emission limit is being proposed for these operations since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

4.3.11 BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Paved and Unpaved Roads

Fugitive particulate emissions can occur from paved and unpaved surfaces.

Step 1: Identify all control technologies

The RACT/BACT/LAER (RBLC) Clearinghouse and review of other permits reveal that the PM control for paved and unpaved roads includes the use dust suppressants, roadway sweeping, covering of transport vehicles, and speed limits.

Add-on Control Technology:

Watering and the use of chemical wetting agents are the principal means for control of emissions from materials handling operations involving transfer of bulk minerals in aggregate form. Dust control can be achieved by: (a) source extent reduction (e.g., mass transfer reduction), (b) source improvement related to work practices and transfer equipment such as load in and load out operations (e.g., drop height reduction, wind sheltering, moisture retention), and (c) surface treatment (e.g., wet suppression).

In most cases, good work practices provide substantial opportunities for emission reduction without the need for investment in a control application program. In particular, spillage of material caused by pile lead-out and maintenance equipment can add a large source component associated with traffic entrained dust. The traffic dust component may easily dominate over emissions from transfer of material and wind erosion. The prevention of spillage and subsequent spreading of material by vehicles traversing the area is essential to cost-effective emission control. If spillage cannot be prevented because of the need for intense use of mobile equipment in the storage pile area, then regular cleanup should be employed as a necessary mitigative measure.

Fugitive emissions from paved roadways can also be controlled by wet suppression systems. These systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems—liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. The wetting agent can be water or a combination of water and a chemical surfactant. This surfactant, or surface active agent, reduces the surface tension of the water. As a result, the quantity of liquid needed to achieve good control is reduced.

Step 2: Eliminate Technically Infeasible Options

The PM control options noted above are feasible control alternatives. Therefore, there is no elimination of technically infeasible fugitive PM control alternatives. There are no other known control alternatives (per review of the BACT/LAER clearinghouse) that have been utilized on roads.

Step 3: Rank Remaining Technically Feasible Control Options

Development of a fugitive dust control plan which includes removal of deposits on roadways, speed limitation on vehicle traffic and wet suppression techniques as needed will be employed as BACT for paved and unpaved roads.

Step 4: Evaluate the Most Effective Controls and Document the Results

The following table lists the proposed particulate BACT determination along with the existing particulate BACT determinations for the paved and unpaved roads. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse identified the following with respect to paved roads:

Facility/ RBLC ID	Permit Date	Basis	Process	PM BACT Limit	Add-On Controls
V&M Star OH-0344	1/27/11	BACT-PSD	Paved and unpaved roadways and parking areas	Fugitive PM10: 7.7 tpy	Employ best available control measures: watering, sweeping, chemical stabilization, or suppressants applied at sufficient frequencies
Nucor Steel OH-0341	12/23/10	BACT-PSD	Roadways	Fugitive PM10: 5.93 tpy	Best available control measures to include watering, resurfacing, chemical stabilization, and/or speed reduction at sufficient frequency to ensure compliance
Flopam, Inc. LA-0240	06/14/10	BACT-PSD	Roadway Fugitives	Total PM10: 0.04 lb/hr	Main roadway shall be paved where practical. Precautions shall be taken to prevent dust from becoming airborne

Facility/ RBLC ID	Permit Date	Basis	Process	PM BACT Limit	Add-On Controls
Consolidated Environmental Management, Inc LA-0239	05/24/10	BACT-PSD	Unpaved Road Fugitive Dust	18.69 lb/hr 81.85 tpy	BACT for road dust is to pave roadways where practicable including areas where the extra heavy vehicles (greater than 50 tons in weight) will not cause damage to paving. Unpaved roads shall utilize water spray or dust suppression chemicals to reduce emissions. Additionally, reduced speed limits of less than or equal to 15 mph will be enforced on all unpaved roadways
V&M Star OH-0328	04/10/09	BACT-PSD	Roadways and parking areas	Filterable PM_{10}: 12.4 tpy using AP-42 emission factors	Control measures sufficient to minimize or eliminate emissions
Rumke Sanitary Landfill OH-0330	12/23/08	BACT-PSD	Paved roadways and parking areas	Filterable PM_{10}: 15.1 tpy	Best available control measures to minimize or prevent emissions, including water flushing and sweeping of paved roads/parking areas; and applying water or other dust suppressant to unpaved roads..
Southwest Electric Power Company AR-0094	11/05/08	BACT-PSD	Roads	PM: 1.1 lb/hr	Watering/dust suppression chemicals
New Steel International, Inc. OH-0315	05/06/08	BACT-PSD	Paved roadways and parking areas	PM: 153.4 tpy fugitive dust	Control measures include application of wet suppressants, watering, speed reduction and vacuuming or sweeping

Based on information presented reviewed for this BACT analysis, the $PM_{10}/PM_{2.5}$ control measures presented above focus solely on measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping. No other applicable $PM_{10}/PM_{2.5}$ control measures were identified in this review.

BACT for paved and unpaved roads associated with this project is proposed as:

- The development of a dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required; and
- No emission limit is being proposed for emissions from paved and unpaved roads since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

4.4 Best Available Control Technology (BACT) Analysis - Emissions of NO_x

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of NO_x emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of NO_x will be controlled to the levels specified.

Nitrogen oxides formation occurs by three fundamentally different mechanisms. The principal mechanism of NO_x formation in natural gas combustion is thermal NO_x. The thermal NO_x mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most NO_x formed through the thermal NO_x mechanism occurs in the high temperature flame zone near the burners. The formation of thermal NO_x is affected by three furnace-zone factors: (1) oxygen concentration, (2) peak temperature, and (3) time of exposure at peak temperature. As these three factors increase, NO_x emission levels increase. The emission trends due to changes in these factors are fairly consistent for all types of natural gas-fired boilers and furnaces. Emission levels vary considerably with the type and size of combustor and with operating conditions (e.g., combustion air temperature, volumetric heat release rate, load, and excess oxygen level). The second mechanism of NO_x formation, called prompt NO_x, occurs through early reactions of nitrogen molecules in the combustion air and hydrocarbon radicals from the fuel. Prompt NO_x reactions occur within the flame and are usually negligible when compared to the amount of NO_x formed through the thermal NO_x mechanism. However, prompt NO_x levels may become significant with ultra-low-NO_x burners. The third mechanism of NO_x formation, called fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Due to the characteristically low fuel nitrogen content of natural gas, NO_x formation through the fuel NO_x mechanism is insignificant. [6]

4.4.1 NO_x Emission Sources Subject to Control Technology Evaluation

The NO_x emission sources associated with the proposed plant that are included in this NO_x BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces (SAFs);
- Natural gas fired combustion equipment; and
- Emergency equipment.

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[6] AP 42, Fifth Edition, Volume I, Chapter 1.4: External Combustion Sources Natural Gas Combustion, July 1998

For a summary of the estimated NO_x emission rates for the sources identified above, please refer to the following table:

NO_x Emission Rates for Sources Evaluated for BACT

Equipment Description	NO_x Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnace (SAFs)	1892.2
Natural Gas Combustion Equipment • Ladle preheaters	14.0
Emergency Equipment: • Emergency Generators	0.02
Total	**1906.2**

4.4.2 BACT Analysis for NO_x Emissions from Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling NO_x emissions from plant operations:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

The following control technologies were identified and evaluated to control NO_x emissions from the semi-enclosed submerged arc furnace (SAF):

(a) Combustion Controls;

(b) Selective Catalytic Reduction (SCR);

(c) Non-Selective Catalytic Reduction (NSCR);

(d) $SCONO_x$ Catalytic Oxidation/Absorption; and

(e) Shell $DeNO_x$ System (modified SCR);

(1) Selective Non-Catalytic Reduction (SNCR) options -

(2) Exxon's Thermal $DeNO_x$ ®

(3) Nalco Fuel Tech's NO_xOUT®

(4) Low Temperature Oxidation (LTO).

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing NO_x emissions from the SAF. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) Combustion Controls - There is an entire group of combustion controls for NO_x reduction from various combustion units as follows:

1. Low Excess Air (LEA) - This control option is typically used in conjunction with some of the other options. The use of this option will result in the generation of additional CO emissions, which is another pollutant under review in this BACT analysis. In addition, LEA is not very effective for implementation in electric arc furnaces that do not operate with combustion air feeds, since the combustion option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.
2. Oxyfuel Burner - The SAF system does not employ natural gas-fired oxyfuel burners, thus, this option will be excluded for further consideration in this BACT analysis.
3. Overfire Air (OFA) - This control option is geared primarily for fuel NO_x reduction, which is not the major NO_x formation mechanism from SAFs. Further, this option is associated with potential operational problems due to low primary air, creating incomplete combustion conditions. Such conditions can result in inefficient processing and unacceptable increases in tap-to-tap times. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.
4. Burners Out Of Service (BOOS) - BOOS and Load Reduction (or Deration) options - incorporate a reduction in furnace load, thereby, potentially reducing NO_x formation. This reduction must be balanced, however, against a longer period of NO_x generation resulting from the furnace's inability to efficiently melt material. Furthermore, both BOOS and Load Reduction are fundamentally inconsistent with the design criterion for the furnace, which is to increase furnace loadings to achieve enhanced production. Therefore, these control options are not technically feasible for this particular application and will not be considered any further in this BACT analysis.

5. Reduced Combustion Air Temperature - This control option inhibits thermal NO_x production. However, the option is limited to equipment with combustion air preheaters which are not applicable to the silicon production operations. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

6. Flue Gas Recirculation (FGR) - FGR option involves recycling a portion of the cooled exit flue gas back into the primary combustion zone. Typically, FGR is useful in reducing thermal NO_x formation by lowering the oxygen concentration in the combustion zone. The primary limitation of FGR is that it alters the distribution of heat (resulting in cold spots) and lowers the efficiency of the furnace. Since it may be necessary to add additional burners (hence, increasing emissions of other pollutants) to the SAF to reduce the formation of cold spots, FGR technology to reduce SAF NO_x emissions is not considered feasible. Since the SAF does not operate on burner combustion, but relies upon the electric arc and chemical energy for oxidation, neither pathway is amenable to FGR application. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(b) Selective Catalytic Reduction (SCR) -- In this process, ammonia (NH_3), usually diluted with air or steam, is injected through a grid system into the exhaust gas stream upstream of a catalyst bed. On the catalyst surface the NH_3 reacts with NO_x to form molecular nitrogen and water. The basic reactions are as follows:

$$4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6H_2O \text{ (i)}$$

$$8NH_3 + 6NO_2 \rightarrow 7N_2 + 12H_2O \text{ (ii)}$$

The reactions take place on the surface of the catalyst. Usually, a fixed bed catalytic reactor is used for SCR systems. The function of the catalyst is to effectively lower the technology include the catalyst reactor design, optimum operating temperature, sulfur content of the charge, catalyst deactivation due to aging, ammonia slip emissions and design of the ammonia injection system.

Depending on system design, NO_x removal of 80 - 90 percent may be achievable under optimum conditions (refer, USEPA "ACT Document - NO_x Emissions from Iron and Silicon productions", Sept., 1994). The reaction of NH_3 and NO_x is favored by the presence of excess oxygen. Another variable affecting NO_x reduction is exhaust gas temperature. The greatest NO_x reduction occurs within a reaction window at catalyst bed temperatures between 600 °F – 750 °F for conventional (vanadium or titanium-based) catalyst types, and 470 °F – 510 °F for platinum-based catalysts. Performance for a given catalyst depends largely on the temperature of the exhaust gas stream being treated. A given catalyst exhibits optimum performance when the temperature of the exhaust gas stream is at the midpoint of the reaction temperature window for applications where exhaust gas oxygen concentrations are greater than 1 percent. Below the optimum temperature range, the catalyst activity is greatly reduced, potentially allowing unreacted ammonia (referred to as "ammonia slip") to be emitted directly to the atmosphere.

The SCR system may also be subject to catalyst deactivation over time. Catalyst deactivation occurs through two primary mechanisms – physical deactivation and chemical poisoning. Physical deactivation is generally the result of either continual exposure to thermal cycling or masking of the catalyst due to entrainment of particulates or internal contaminants. Catalytic poisoning is caused by the irreversible reaction of the catalyst with a contaminant in the gas stream. Catalyst suppliers typically guarantee a 3-year catalyst lifetime for a sustainable emission limit.

In order for an SCR system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates, NO_x concentrations, and temperature. In addition, certain elements such as iron, nickel, chrome, and zinc can react with platinum catalysts to form compounds or alloys which are not catalytically active. These reactions are termed "catalytic poisoning", and can result in premature replacement of the catalyst. An SAF flue gas may contain a number of these catalytic poisons. In addition, any solid material in the gas stream can form deposits and result in fouling or masking of the catalytic surface. Fouling occurs when solids obstruct the cell openings within the catalyst. Masking occurs when a film forms on the surface of catalyst over time. The film prevents contact between the catalytic surface and the flue gas. Both of these conditions can result in frequent cleaning and/or replacement requirements. Due to the above effective technical applicability constraints, SCR technology has never been applied to silicon production operations, and will be eliminated for further evaluation in this BACT analysis.

(c) Non-Selective Catalytic Reduction (NSCR) - The NSCR system is a post-combustion add-on exhaust gas treatment system. It is often referred to as a "three-way conversion" catalyst since it reduces NO_x, unburned hydrocarbons (UBH), and CO simultaneously. In order to operate properly, the combustion process must be stoichiometric or near stoichiometric which is not maintained in an SAF and varies widely under regular operation. Under stoichiometric conditions, in the presence of the catalyst, NO_x is reduced by CO, resulting in nitrogen and carbon dioxide. Currently, NSCR systems are limited to rich-burn IC engines with fuel rich ignition system applications. In view of the above limitations, the NSCR option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(d) $SCONO_x$-Catalytic Oxidation/Absorption -- This is a catalytic oxidation/absorption technology that has been applied for reductions of NO_x, CO and VOC from an assortment of combustion applications that mostly include – small turbines, boilers and lean-burn engines. However, this technology has never been applied to silicon production operations.

An effective $SCONO_x$ application to a SAF has the following reservations:

(1) The technology is not readily adaptable to high-temperature applications outside the 300-700 °F range and is susceptible to thermal cycling that will be experienced in the MS Silicon application;

(2) Scale-up is still an issue. The technology has not been demonstrated for larger applications;

(3) Optimum $SCONO_x$ operation is predicated by stable gas flow rates, NO_x concentrations and temperature. As discussed earlier, the nature of SAF operations does not afford any of these conditions which will significantly impair the effective control efficiency of the $SCONO_x$ system;

(4) The catalyst is susceptible to moisture interference and the vendor indicates negation of its warranties and performance guarantees if the catalyst is exposed to any quantity of liquid water. However, during certain atmospheric conditions, the catalyst could be potentially exposed to moisture following a unit shutdown;

(5) The prospect of moving louvers that effect the isolation of the saturated catalyst readily lends itself to the possibility of thermal warp and in-duct malfunctions in general. The process is dependent on numerous hot-side dampers that must cycle every 10-15 minutes. Directional flow solutions are not yet known to have been implemented for this technology;

(6) The K_2CO_3 coating on the catalyst surface is an active chemical reaction and reformulation site which makes it particularly vulnerable to fouling. On some field installations, the coating has been found to be friable and tends to foul in the harsh in-duct environment;

(7) During the regeneration step, the addition of the flammable reducing gas (natural gas which contains 85% methane) into the hot flue gas generates the possibility of LEL exceedances and subsequently catastrophic failure in the event the catalyst isolation is not hermetic or there is a failure in the carrier steam flow; and

(8) There is a possibility of some additional SO_2 emissions if the dry scrubber with the tandem "guard-bed" $SCOSO_x$ unit experiences a malfunction. Thus, there are significant reservations regarding effective technical applicability of this control alternative for a silicon production SAF application. Moreover $SCONO_x$ technology has never been proposed nor successfully implemented for similar industry applications. In view of the above limitations, $SCONO_x$ is considered technically infeasible for the present application and will not be considered any further in this BACT analysis.

(e) Shell $DeNO_x$ System (modified SCR) - The Shell $DeNO_x$ system is a variant of traditional SCR technology which utilizes a high activity dedicated ammonia oxidation catalyst based on a combination of metal oxides. The system is comprised of a catalyst contained in a modular reactor housing where in the presence of ammonia NO_x in the exhaust gas is converted to nitrogen and water. The catalyst is contained in a low-pressure drop lateral flow reactor (LFR), which makes best use of the plot space available. Due to the intrinsically high activity of the catalyst, the technology is suited for NO_x conversions at lower temperatures with a typical operating range of 250-660 ^{o}F.

The low temperature operation is the only aspect of the Shell $DeNO_x$ technology that marks its variance from traditional SCR technology. From an SAF application standpoint, there are no additional differences between this technology and SCR technology.

In summary, an effective Shell $DeNO_x$ application to the SAF application has the following reservations:

(1) The Shell $DeNO_x$ system does not suffer from similar placement limitation considerations discussed earlier for SCRs. However, even a downstream of the SAF baghouse placement of the system does not render it completely safe from the prospect of particulate fouling. The catalyst will still be exposed to particulates, which can inflict a masking effect impairing the effective control efficiency of the system;

(2) Optimum Shell $DeNO_x$ operation is predicated by stable gas flow rates, NO_x concentrations and temperature. The nature of silicon production operations does not afford any of these conditions which will significantly impair the effective control efficiency of the Shell $DeNO_x$ system;

(3) The catalyst is particularly susceptible to thermal fluctuations;

(4) The use of relatively large amounts of ammonia - a regulated toxic chemical – will have accidental release and hazardous impact implications; and

(5) Even a 7 parts per million by volume (ppmv) ammonia slip from a 500,000 acfm exhaust gas flow can result in a significant increase of emissions of ammonia which is a regulated hazardous air pollutant with well documented health impacts.

Thus, there are significant reservations regarding effective technical applicability of this control alternative for an SAF application. Moreover Shell $DeNO_x$ has never been proposed nor successfully implemented for similar applications. Therefore, the Shell $DeNO_x$ option is considered technically infeasible and will not be considered any further in this BACT analysis.

(f) Selective Non-Catalytic Reduction (SNCR) - The three commercially available SNCR systems are Exxon's Thermal $DeNO_x$ ® system, Nalco Fuel Tech's NO_xOUT® system and Low Temperature Oxidation (LTO). These technologies are reviewed below for technical feasibility in controlling SAF NO_x emissions.

(1) Exxon's Thermal $DeNO_x$ ® - Exxon's Thermal $DeNO_x$ ® system is a non-catalytic process for NOx reduction. The process involves the injection of gas-phase ammonia (NH_3) into the exhaust gas stream to react with NO_x. The ammonia and NO_x react according to the following competing reactions:

$$2NO + 4NH_3 + 2O_2 \rightarrow 3N_2 + 6H_2O \text{ (i)}$$

$$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O \text{ (ii)}$$

The temperature of the exhaust gas stream is the primary criterion controlling the above selective reaction. Reaction (i) dominates in the temperature window of 1,600 °F - 2,200 °F resulting in a reduction of NO_x. However above 2,200 °F, reaction (ii) begins to dominate, resulting in enhanced NO_x production. Below 1,600 °F, neither reaction has sufficient activity to produce or destroy NOx. Thus, the optimum temperature window for the Thermal $DeNO_x$® process is approximately 1,600 °F - 1,900 °F. The above reaction temperature window can be shifted down to approximately 1,300 °F - 1,500 °F with the introduction of readily oxidizable hydrogen gas. In addition, the process also requires a minimum of 1.0 second residence time in the desired temperature window for any significant NO_x reduction.

In order for the Thermal $DeNO_x$ ® system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates; ensuring the required residence time and be within the prescribed temperature range. Based on review of readily available information, application of Thermal $DeNO_x$® technology to control NO_x emissions from silicon production operations are not

known. Therefore, this option is considered technically infeasible and will not be considered any further in this BACT analysis.

In summary, an effective Thermal $DeNO_x$ ® application to the SAF application has the following reservations:

(A) The placement of the Thermal $DeNO_x$ ® system in an adequate temperature regime. In order to achieve optimum operational efficiency the system should be located in a temperature region of at least 1,300 °F and preferably between 1,600 °F - 1,900 °F which would put it upstream of the SAF baghouse. Such a placement configuration would not afford the desired temperature range, which would be typically in the region of 300 °F - 400 °F with an entry temperature of 250 °F at the inlet to the SAF baghouse. The system cannot be placed further upstream for operational hazard reasons. Also any injection mechanism upstream of the baghouse will be susceptible to prompt particulate fouling;

(B) Optimum Thermal $DeNO_x$ ® operation is predicated by stable gas flow rates, NO_x concentrations and temperature. The nature of silicon production operations does not afford any of these conditions which will significantly impair the effective control efficiency of the Thermal $DeNO_x$ ® system; and

(C) The use of relatively large amounts of ammonia - a regulated toxic chemical - will have accidental release and hazardous impact implications.

(2) Nalco Fuel Tech's NO_xOUT® - The NO_xOUT® process is very similar in principle to the Thermal $DeNO_x$ ® process, except that it involves the injection of a liquid urea (NH_2CONH_2) compound (as opposed to NH_3) into the high temperature combustion zone to promote NO_x reduction. The chemical reaction proceeds as follows:

$$NH_2 + NO \rightarrow N_2 + H_2O \text{ (i)}$$

The reaction involves the decomposition of urea at temperatures of approximately 1,700 °F - 3,000 °F. Certain proprietary additive developments have allowed the operational temperature window to shift to approximately 1,400 °F - 2,000 °F. However, the process still has similar constraints as the Thermal $DeNO_x$ ® system. The limitations are dictated by the reaction-controlling variables such as stable gas flow rates for a minimum residence time of 1.0 second in the desired temperature window to ensure proper mixing.

As with the Thermal $DeNO_x$ ® system, the NO_xOUT® system suffers from essentially similar limitations to effectively reduce NOx emissions from SAF operations. Moreover, applications of the NO_xOUT® technology to control NOx emissions from silicon production operations are not known. Therefore, this option is considered technically infeasible and will not be considered any further in this BACT analysis.

Similar to the Thermal $DeNO_x$® application, an effective NO_xOUT® application to the SAF application has the following reservations:

(A) The placement of the NO_xOUT® system in an adequate temperature regime. In order to achieve optimum operational efficiency the system should be located in a temperature region preferably between 1,400 °F - 2,000 °F which would put it upstream of the SAF baghouse. Firstly, such a placement configuration would not afford the desired temperature range, which would be typically in the region of 300 °F -400 °F with an entry temperature of 250 °F at the inlet to the SAF baghouse. Also any injection mechanism upstream of the baghouse will be susceptible to prompt particulate fouling;

There are significant reservations regarding effective technical applicability of this control alternative for an SAF application. In order for the NO_xOUT® system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates, ensuring the requisite residence time requirements and temperature. The temperature of the SAF exhaust gas will vary widely over the melt cycle, and will not remain in the desired temperature window during all phases of operation. Similarly, the gas flow rates will not remain stable during furnace operation, precluding the possibility of adequate residence time. Moreover, NO_xOUT® technology has never been proposed nor successfully implemented to control NO_x emissions from SAFs.

(3) Low Temperature Oxidation (LTO) - LTO technology has never been utilized for any silicon production application. The technology is a variant of SNCR technology using ozone. The ozone is injected into the gas stream and the NO_x in the gas stream is oxidized to nitrogen pentoxide (N_2O_5) vapor, which is absorbed in the scrubber as dilute nitric acid (HNO_3). The nitric acid is then neutralized with caustic (NaOH) in the scrubber water forming sodium nitrate ($NaNO_3$). The overall chemical reaction can be summarized as follows:

$$NO_2 + NO + 2O_3 + NaOH \rightarrow HNO_3 + NaNO_3 + 2O_2 \quad (i)$$

For optimal performance, the technology requires stable gas flows, lack of thermal cycling, invariant pollutant concentrations and residence times on the order of 1 - 1.5 seconds. In addition, LTO technology requires frequent calibration of analytical instruments, which sense the NO_x concentrations for proper adjustment of ozone injection. Since LTO uses ozone injection, it has a potential for ozone slip, which can vary between 5 - 10 ppmv. Also, the technology requires a cooler flue gas of less than 300 °F at the point of ozone injection; otherwise the reactive gas is rendered redundant. The technology also suffers from low NO_x conversion rates (40% - 60%), potential for nitric acid vapor release (in the event of a scrubber malfunction) with subsequent regional haze impacts and the handling, treatment and disposal issues for the spent scrubber effluent.

The technology is neither applicable nor proven for silicon production SAF applications and attendant limitations render it technically infeasible in its current manifestation. In view of the above, the LTO control option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

All control alternatives identified in Step 2 were eliminated as not technically feasible for controlling NO_x emissions from the silicon production operations, with the exception of good operating combustion practices.

Step 4 – Evaluate the Most Effective Controls and Document Results

Good operating and combustion practices were the only technically feasible control option in controlling NO_x emissions from the SAF.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for SAFs or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to SAFs at silicon production plants:

Facility/ RBLC ID	Permit Date	Process	NO_x Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	NOx: 87.6 lb/hr Capacity: 22 MW/hr NOx: 4.0 lbs/MW	No control
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	NOx: 66.0 lb/hr Capacity: 20 MW/hr NOx: 3.3 lbs/MW	No control
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	NOx: 462 tpy NOx: 110 lb/hr Nominal Capacity: 18,000 tons/yr NOx: 51.3 lbs/ton silicon	No controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	None	No controls

As shown in the above table, NO_x emissions from SAFs are uncontrolled. None of the sources as reflected in the above table have proposed or successfully implemented any add-on control devices to control NO_x emissions from SAFs operation.

MS Silicon is proposing the NO_x BACT for the SAFs (AA-201) as follows:

- **NO_x emissions from each of the SAFs shall be limited to 45 lbs/ton (averaged over a 30-day period) of silicon produced.**

4.4.3 BACT Analysis for NO_x Emissions from Natural Gas Combustion

Natural Gas Combustion Sources – Includes the following:

- Ladle Pre-Heaters (4 – 10.0 MMBtu/hr): 14 tpy NO_x;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control NO_x that is emitted at from each combustion unit. See below table for summary of NO_x BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	NO_x BACT Limit	Controls
SeverCorr LLC Columbus, Mississippi	07/15/11	BACT-PSD	Ladle preheaters, ladle dry-out heaters, Tundish preheaters, Tundish dry-out heaters, vertical ladle holding station	0.08 to 0.1 lb/MMBtu	Combustion of natural gas only
Nucor Steel, Marion, Inc. OH-0341	12/23/10	BACT-PSD	Ladle preheaters, tundish preheaters	Mass emission rate of 27.60 lb/hr	Use of natural gas low NO_x burners.
Osceola Steel Co., Adel, Georgia	3/15/10	BACT-PSD	Preheaters	0.1 lb/MMBtu	Combustion of natural gas, good combustion practices

Facility/ RBLC ID	Permit Date	Basis	Process	NO_x BACT Limit	Controls
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	3 Ladle Preheater and 2 refractory drying	0.10 lb/MMBtu	Combustion of natural gas
Minnesota Steel Industries, LLC MN-0070	09/07/07	BACT-PSD	Ladle/Tundish Preheater	No limit	Natural gas combustion and low NO_x burners
Gerdau Ameristeel Wilton IA-0087	05/29/07	BACT-PSD	North Ladle Dryer, South Ladle Dryer and Preheaters, Northwest Ladle Dryers	100 lb/mmscf	Good combustion practices
Nucor Steel AR-0090	04/03/06	BACT-PSD	Ladle Dryer	0.1000 lb/MMBtu	Low NO_x burners
Republic Engineered Products, Inc. OH-0303	08/30/05	LAER	Ladle Dryers/Preheaters	0.1000 lb/MMBtu	Low NO_x burners
Charter Manufacturing Co. Inc. Charter Steel OH-0276	06/10/04	BACT-PSD	Ladle Preheater and Dryers	0.98 lb/hr 4.29 ton/yr Limits are for each preheater	None
Nucor Corp TX-0417	1/15/03	BACT-PSD	Process heaters, ladle and tundish	0.100 lb/MMBtu	Low NO_x burners and clean fuel
Nucor Steel IN-0090	01/19/01		6 Ladle Preheaters	0.100 lb/MMBtu, 6.0 lb/hr total	Low NO_x burners

As shown in the above table, no controls other than low NO_x burners, good combustion practices and combustion of clean fuel are used for NO_x emissions from the natural gas combustion equipment.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling NO_x emissions. No similar sized natural gas combustion devices were identified using add-on NO_x controls as BACT.

Thus, BACT is defined as combustion of clean fuel, low NO_X burners, and good combustion practices. For the natural gas combustion sources associated with the proposed Plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of NO_x control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

Thus, BACT is defined as:

- **NO_x emission rate of 0.08 lbs/MMBtu;**
- **Low NO_x or equivalent burners/technology;**
- **Combustion of clean fuel; and**
- **Good combustion practices.**

4.4.4 BACT Analysis for NO_x Emissions from Emergency Equipment (AA-501)

Emergency Equipment – Includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP):0.02 tpy NO_x;

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control NO_x that is emitted from emergency generators. See below table for summary of NO_x BACT determinations from the RBLC database:

Step 2 - Technical Feasibility of NO_x Control Alternatives

The emergency distillate generator will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. The projected annual NOx emissions rate is 0.02 tpy. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of NO_x emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control NO_x emissions from the emergency generator, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing NO_x BACT determinations for diesel fired emergency generators. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	NO_x BACT Limit	Add-On Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	6.4 G/KW-H NOX+NMHC	No controls The emergency generators shall comply with the emission limit and demonstrate compliance in accordance with the procedures given in NSPS 40 CFR 60, Subpart IIII.
Idaho Power Company (ID-0018)	6/25/10	Emergency Diesel Generator	6.4 G/KW-H NOx+NMHC	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389	12/29/09	Emergency ULSD Generator	6.4 G/KW-H NOx+NMHC	Engine design and operation
Verenium (FL-0318)	12/10/09	Emergency generators	6.4 G/KW-H NOx+NMHC	None
Lake Charles Cogeneration, LLC (LA-0231)	06/22/09	Emergency Diesel Power Generator Engines (1341 HP)	17.09 lb/h	Comply with 40 CFR 60 Subpart IIII
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII
		500 KW emergency generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	6.4 G/KW-H NOx+NMHC	None

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII; good combustion/operating practices, and the use of ultra-low sulfur diesel (ULSD) fuel.

Step 5 – Select BACT for NO_x from Emergency Equipment (AA-501)

BACT is proposed as:

- **Compliance with NSPS IIII;**
- **Good combustion/operating practices, and**
- **Use of ULSD.**

4.5 Best Available Control Technology (BACT) Analysis - Emissions of CO

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of CO emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of CO will be controlled to the levels specified.

Large amounts of carbon monoxide and organic materials are emitted by submerged electric arc furnaces. Carbon monoxide is formed as a byproduct of the chemical reaction between oxygen in the metal oxides of the charge and carbon contained in the reducing agent (coke, coal, etc.). Reduction gases containing organic compounds and carbon monoxide continuously rise from the high-temperature reaction zone, entraining fine particles and fume precursors. The mass weight of carbon monoxide produced sometimes exceeds that of the metallic product.[7]

4.5.1 CO Emission Sources Subject to Control Technology Evaluation

The CO emission sources associated with the proposed plant that are included in this CO BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces;
- Natural gas fired combustion equipment; and
- Emergency equipment.

For a summary of the estimated CO emission rates for the sources identified above, please refer to the following table:

CO Emission Rates for Sources Evaluated for BACT

Equipment Description	CO Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnace	1429.6
Natural Gas Combustion Equipment • Ladle preheaters	14.4

[7] AP-42 Chapter 12.4 Ferroalloy Production, 10/86

Equipment Description	CO Emission Rate (tons/year)
Emergency Equipment: • Emergency Generator	0.19
Total	1444.3

A summary of the BACT determinations for CO is presented in Table 4-4.

4.5.2 BACT Analysis for CO Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling emissions from the semi-enclosed submerged electric arc furnaces:

1. On-line USEPA Control Technology Database; and
2. State Air Quality Permits

The following control technologies were identified and evaluated to control CO emissions from the SAFs:

(a) Operating Practice Modifications;

(b) Flaring of CO Emissions;

(c) CO Oxidation Catalysts;

(d) Post-Combustion Reaction Chamber;

(e) Catalytic Incineration; and

(f) Oxygen Injection.

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing CO emissions from the SAF. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) Operating Practice Modifications -- Due to marketplace demands on the type of products to be manufactured and the required product quality, MS Silicon does not propose any additional operating practice modifications that will alter CO emissions from the existing semi-enclosed SAF. Therefore, this control option will be eliminated for further evaluation in this BACT analysis.

(b) Flaring of CO Emissions -- Based upon a review of the previously listed information resources, there is no known application of flaring SAF exhaust gases. Flaring of emissions for CO destruction would require raising the exhaust gas temperature. Thus, based on the relatively large gas volumetric flow at a substantial temperature differential, the auxiliary fuel requirements needed to operate the flare would be overwhelmingly large. Additionally, it can be speculated as to whether the flare would actually result in a decrease of CO emissions or increase thereof from supplemental fuel combustion, which would also result in an increase of NO_x emissions. Consequently, this control alternative is considered technically infeasible for SAF exhausts and thus, will not be considered any further in this BACT analysis.

(c) CO Oxidation Catalysts -- Based upon a review of the previously listed information resources, there is no known application of CO oxidation catalysts to control CO emissions from a SAF. The optimal working temperature range for CO oxidation catalysts is approximately 850 °F - 1,100 °F with a minimum exhaust gas stream temperature of 500 °F for minimally acceptable CO control. Exhaust gases from the SAF will undergo rapid cooling as they are ducted from the furnace. Thus, the temperature will be far below the minimum 500 °F threshold for effective operation of CO oxidation catalysts. Additionally, the particulate loading in the exhaust gas stream is anticipated to be too high for efficient operation of a CO oxidation catalyst. Masking effects such as plugging and coating of the catalyst surface would almost certainly result in impractical maintenance requirements, and would significantly degrade the performance of the catalyst. Consequently, this control alternative is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(d) Post-Combustion Reaction Chambers -- Based upon a review of the previously listed information resources, there is no known successful application of duct burners or thermal incinerators to control CO emissions from silicon production operations. The feasibility of these units to effectively reduce CO emissions, without resulting in severe operational problems, is unknown. Further, such units are expected to consume large quantities of natural gas and oxygen; resulting in excessive annual operating costs.

The principle of destruction within post combustion chambers is to raise the SAF exhaust gases to a sufficiently high temperature and for a minimum amount of time to facilitate oxidation. The combustion chamber configuration must provide effective mixing within the chamber with an acceptable residence time. Recuperative heat exchangers can be used with these systems to recover a portion of the exiting exhaust gas heat and reduce the auxiliary fuel consumption.

The amount of CO which could be oxidized with post combustion systems is uncertain, and precise performance guarantees are expected to be difficult to obtain from equipment manufacturers

because of the lack of operating experience. In addition, there is the potential for additional emissions of CO from auxiliary fuel combustion. Further, due to the heat and particulate loading, the burners would have a short life expectancy, and may sustain severe maintenance and reliability problems. Additionally, a single or multiple duct burner system would not be able to heat the relatively cool gases from the SAF during cold cycling. Potentially, there are two locations where post combustion chambers can be installed, i.e., upstream or downstream of an SAF baghouse. Locating upstream of the baghouse would take advantage of slightly elevated temperatures in the exhaust gas stream. However, at this location, the post combustion chamber would be subject to high particulate loading. The units would be expected to foul frequently from the particulate accumulation, and the burners would have severe maintenance and reliability problems. Thus, the installation of the post combustion chamber upstream of the baghouse is considered technically infeasible. Alternatively, the post combustion chamber could be installed downstream of the SAF baghouse. However, even at this location, fouling due to particulate matter can occur and more importantly, even cooler exhaust temperatures would be encountered. These cooler temperatures would greatly increase the auxiliary fuel requirements. Further, the combustion of additional fuel will result in increases in emissions to the atmosphere.

Based upon the above discussions, the use of a post combustion chamber is considered technically infeasible for the silicon production operations and will not be considered any further in this BACT analysis.

(e) Catalytic Incineration -- Based upon a review of the previously listed information resources, there is no known application of catalytic incineration to control CO emissions from silicon production operations. Catalytic incinerators use a bed of catalyst that facilitates the overall combustion of combustible gases. The catalyst increases the reaction rate and allows the conversion of CO to CO_2 at lower temperatures than a thermal incinerator. The catalyst is typically a porous noble metal material which is supported in individual compartments within the unit. An auxiliary fuel-fired burner ahead of the bed heats the entering exhaust gases to 500 °F – 600 °F to maintain proper bed temperature. Recuperative heat exchangers are used to recover the exiting exhaust gas heat and reduce the auxiliary fuel consumption. Secondary energy recovery is typically 70 percent.

Catalytic incineration systems are limited in application due to potential poisoning, deactivation, and/or blinding of the catalyst. Lead, arsenic, vanadium, and phosphorus are generally considered poisons to catalysts and deactivate the available reaction sites on the catalyst surface. Particulate can also build up on the catalyst, effectively blocking the porous catalyst matrix and rendering the catalyst inactive. In cases of significant levels of poisoning compounds and particulate loading, catalyst replacement costs are significant.

As in the thermal incineration discussion, potentially, there are two locations where the incinerator can be installed, i.e., upstream or downstream of the SAF baghouse. For the same reasons discussed earlier (e.g., fouling due to particulate matter), the upstream location is considered technically infeasible. Alternatively, the incinerator can be installed downstream of the meltshop

baghouse. However, even at this location, fouling due to particulate matter can occur, and further, the exhaust will be at a lower temperature. These cooler temperatures would greatly increase the auxiliary fuel requirements. The associated combustion of additional auxiliary fuel will result in an unacceptable increase in operating costs. Further, the combustion of additional fuel will result in increases in emissions to the atmosphere.

Due to the lack of application of catalytic incineration for SAFs and potentially adverse technology applicability issues, this control alternative is considered technically infeasible and will not be considered any further in this BACT analysis.

(f) Oxygen Injection -- Based upon a review of the previously-listed information resources, there is no known application of oxygen injection for controlling CO emissions from SAFs.

A theoretical means of reducing CO would be oxygen injection at the entrance of the ductwork to increase oxidation of the available CO to CO_2. The increase in CO oxidation which could be achieved, however, is unknown. This approach would be purely experimental and is a procedure that is currently not conducted in silicon production operations in silicon productions in the United States. Consequently, this control alternative is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

All control alternatives identified in Step 2 were eliminated as not technically feasible for controlling CO emissions from the SAF.

Step 4 – Evaluate the Most Effective Controls and Document Results

Good operating practices are only technically feasible control option in controlling CO emissions from the SAF.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to submerged electric arc furnaces at silicon production plants:

Facility/ RBLC ID	Permit Date	Process	CO Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	No limit	No control
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	CO: 88.9 lb/hr Capacity: 20 MW/hr CO: 4.4 lbs/MW	No control
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	CO: 54.0 lb/hr Nominal Capacity: 2 tons/hr CO: 27 lbs/ton silicon	No controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	None	No controls

As shown in the above table, CO emissions from submerged electric arc furnaces are uncontrolled. None of the sources as reflected in the above table have proposed or successfully implemented any add-on control devices to control CO emissions from SAF operation.

MS Silicon is proposing the BACT for CO as follows:

- **Total CO emissions from the SAF shall be limited to 34 lbs/ton (averaged over a 30-day period) of silicon produced;**
- **Good combustion and operating practices; and**
- **Utilization of a semi-enclosed SAF design.**

4.5.3 BACT Analysis for CO Emissions from Natural Gas Combustion (AA-202)

Natural Gas Combustion Sources – Includes the following:

- Ladle Pre-Heaters (4 – 10.0 MMBtu/hr): 14.4 tpy CO;

Step 1 – Identify Control Options,

According to information available in the RBLC, EPA's Compilation of Air Pollutant Emission Factors and the EPA's CATC Technical Bulletins and Air Pollution Control Technology Fact Sheets, there are no reasonably available add-on control options to control CO emissions from natural gas combustion units. This review did not identify natural gas combustion equipment associated with silicon production employing add-on controls to control combustion related emissions from natural gas combustion sources.

Step 2 – Eliminate Technically Infeasible Control Options

No technically feasible control options were identified to control the small quantities of CO from similar sized natural gas combustion equipment.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

No technically feasible control options were identified.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling CO emissions. No similar sized natural gas combustion devices were identified add-on CO controls as BACT.

Facility/RBLC ID	Permit Date	Basis	Process	CO BACT Limit	Add-On Controls
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	Ladle Preheater and refractory drying	0.0840 lb/MMBtu	Combustion of natural gas
New Steel International, Inc OH—0315	5/6/08	BACT-PSD	Tundish Preheaters	0.0840 lb/MMBtu	Natural gas combustion
Gerdau Ameristeel Wilton IA-0087	05/29/07	BACT-PSD	North Ladle Dryer, South Ladle Dryer and Preheaters, Northwest Ladle Dryers	84 lb/mmscf	Good combustion practices

Facility/RBLC ID	Permit Date	Basis	Process	CO BACT Limit	Add-On Controls
Nucor Steel AR-0090	04/03/06	BACT-PSD	Ladle Dryer	0.0840 lb/MMBtu	Good combustion practice
Republic Engineered Products, Inc OH-0303	08/30/05	LAER	Ladle Dryers/Preheaters	84.0 lb/Mmscf	Best operational and engineering practices
Charter Manufacturing Co. Inc. Charter Steel OH-0276	06/10/04	BACT-PSD	Tundish Preheaters	0.0820 lb/MMBtu each preheater	None
Charter Manufacturing Co. Inc. Charter Steel OH-0276	06/10/04	BACT-PSD	Ladle Preheater and Dryers	0.0820 lb/MMBtu each preheater	None
Nucor Steel IN-0090	01/19/01	BACT-PSD	Tundish Preheaters	No limit	Use of natural gas
Nucor Steel IN-0090	01/19/01	BACT-PSD	Ladle Preheaters	No limit	Natural gas or propane combustion

As shown in the above table, no controls other than good combustion practices and combustion of clean fuel are used for CO emissions from the natural gas combustion equipment. The variation of 0.0820 to 0.0840 lb/MMBtu is based on different heating values for natural gas.

Thus, BACT for CO emissions from equipment combusting natural gas is defined as:

- **CO emission rate of 0.0840 lbs/MMBtu;**
- **Combustion of natural gas; and**
- **Good combustion practices.**

4.5.4 BACT Analysis for CO Emissions from Emergency Equipment (AA-501)

Emergency Equipment – Includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP): 0.7 tpy CO.

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control CO that is emitted from emergency equipment. See below table for summary of CO BACT determinations from the RBLC database:

Step 2 - Technical Feasibility of CO Control Alternatives

The emergency diesel fired generator will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for less than 100 hours per year. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of CO emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control CO emissions from the emergency generator, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing CO BACT determinations for diesel fired emergency generators. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	CO BACT Limit	Add-On Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	3.5 G/KW-H	No controls The emergency generators shall comply with the emission limit and demonstrate compliance in accordance with the procedures given in NSPS 40 CFR 60, Subpart IIII.
Idaho Power Company ID-0018	6/25/10	750 KW Emergency Diesel Generator	3.5 G/KW-H	Tier 2 Engine, Good combustion practices

Facility/ RBLC ID	Permit Date	Process	CO BACT Limit	Add-On Controls
Consumers Energy (MI-0389	12/29/09	2000 KW Emergency ULSD Generator	3.5 G/KW-H	Engine design and operation
Verenium (FL-0318)	12/10/09	2000 KW Emergency generators	3.5 G/KW-H	None
Lake Charles Cogeneration, LLC (LA-0231)	06/22/09	Emergency Diesel Power Generator Engines (1341 HP)	0.62 lb/h	Comply with 40 CFR 60 Subpart IIII
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, limited to 100 hours of operation per year
		500 KW emergency generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, limited to 100 hours of operation per year
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	3.5 G/KW-H	None

As shown in the table above, BACT for the emergency equipment has been determined to be compliance with NSPS IIII and good combustion/operating practices

Step 5 – Select BACT for CO from Emergency Equipment

BACT for CO emissions from the emergency equipment is proposed as:

- **Compliance with NSPS IIII; and**
- **Good combustion/operating practices.**

4.6 Best Available Control Technology (BACT) Analysis - Emissions of SO_2

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of SO_2 emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes.

The source of SO_2 emissions is attributable to the sulfur content of the raw materials charged in the SAFs and from the sulfur content of the fuels to be combusted in supporting operations to be performed at the plant.

4.6.1 SO2 Emission Sources Subject to Control Technology Evaluation

The SO_2 emission sources associated with the proposed plant that are included in this SO_2 BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces;
- Natural gas fired combustion equipment; and
- Emergency equipment.

For a summary of the estimated SO_2 emission rates for the sources identified above, please refer to the following table:

SO_2 Emission Rates for Sources Evaluated for BACT

Equipment Description	SO_2 Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnace	2169.7
Natural Gas Combustion Equipment • Ladle preheaters	0.10
Emergency Equipment: • Emergency Generator	0.27
Total	2170.0

4.6.2 BACT Analysis for SO_2 Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling SO_2 emissions from plant operations:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

The following control technologies were identified and evaluated to control SO_2 emissions from the SAFs:

(a) Lower-Sulfur Charge Substitution; and

(b) Flue Gas Desulfurization (FGD) options:

(1) Wet Scrubbing;

(2) Spray Dryer Absorption (SDA); and

(3) Dry Sorbent Injection (DSI).

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing SO_2 emissions from the SAFs. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) Lower-Sulfur Charge Materials - Substitution with lower sulfur-bearing raw materials is technically feasible and will be included in this analysis. A summary of the charge materials and sulfur content of the materials, are described below.

Coal - The Department of Energy estimates that the use of the lowest sulfur coal can result in up to 85 percent lower SO_2 emissions than the use of many types of higher sulfur coal[8]. In the U.S., coal from eastern states including Ohio, Pennsylvania, and West Virginia has higher sulfur content, accounting for 3 to 10 percent of the coal's weight; coal from western states such as Wyoming, Montana, Utah, and Colorado can have sulfur contents that make up less than 1 percent of its weight[9]. However, low-sulfur coal is significantly more expensive

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[8] ↑ Annual Energy Outlook 2002 with Projections to 2020, US Department of Energy, January 2002

[9] Cleaning up Coal, U.S. Department of Energy

than higher sulfur coal, and often incurs additional transportation costs. MS Silicon will work to utilize the lowest cost effective, available coal source. The success of the plant is to produce a high quality silicon product that is cost competitive within the industry. MS Silicon will be utilizing a best available SAF and supporting equipment to:

1) Produce a cost competitive product;

2) Minimizes emissions of regulated air pollutants; and

3) Utilize good combustion practices and operating equipment to minimize the plant's energy/GHG footprint.

Wood - The low sulfur content of wood (0.007 to 0.08% by weight sulfur) minimizes SO_2 emissions

(b) Flue Gas Desulfurization –

FGD systems currently in use for SO_2 abatement can be classified as wet and dry systems. Based on a review of the RBLC database and state permits, it was revealed that control technologies for SO_2 abatement have not been implemented for SAFs. However, FGD options which have been traditionally applied to utility boilers may be available to control SO_2 from the SAFs. Therefore, the application of these technologies to the SAFs will be examined further.

The suitability of gas absorption as a pollution control method is generally dependent on the following factors:

1) Availability of suitable solvent;

2) Required removal efficiency;

3) Pollutant concentration in the inlet vapor;

4) Capacity required for handling waste gas; and,

5) Recovery value of the pollutant(s) or the disposal cost of the spent solvent.

Gas absorbers are most widely used to remove water soluble inorganic contaminants from air streams with typical pollutant concentrations ranging from 250 to 10,000 ppmv.[10] The SO_2 concentration from the proposed SAFs has been estimated at 8 ppm. For FGD controls in general, the expected variability and low SO_2 concentrations in the gas stream are not amenable to FGD which is typically geared for high sulfur fuel combustion systems.

(1) Wet Scrubbing -- Wet scrubbers are regenerative processes which are designed to maximize contact between the exhaust gas and an absorbing liquid. The exhaust gas is

[10] SO_2 and Acid Gas Controls, Sixth Edition, EPA/452/B-02-001

scrubbed with a 5 - 15 percent slurry, comprised of lime (CaO) or limestone ($CaCO_3$) in suspension. The SO_2 in the exhaust gas reacts with the CaO or $CaCO_3$ to form calcium sulfite ($CaSO_3.2H_2O$) and calcium sulfate ($CaSO_4$). The scrubbing liquor is continuously recycled to the scrubbing tower after fresh lime or limestone has been added.

The types of scrubbers which can adequately disperse the scrubbing liquid include packed towers, plate or tray towers, spray chambers, and venturi scrubbers. In addition to calcium sulfite/sulfate, numerous other absorbents are available including sodium solutions and ammonia-based solutions[11].

There are various potential operating problems associated with the use of wet scrubbers. First, particulates are not acceptable in the operation of wet scrubbers because they would plug spray nozzles, packing, plates and trays. Thus, the scrubber would have to be located downstream of the SAFs baghouses. This would substantially increase the capital cost of the wet scrubber, which is typically two to three times more expensive than the capital cost for a dry scrubber. Wet scrubbers also require handling, treatment, and disposal of a sludge by-product. In this case, air emissions would be exchanged for a large-scale water pollution problem. Treatment of wet scrubber wastes requires advanced wastewater treatment including frequent maintenance by an experienced operator. The SO_2 concentration will vary widely over the SAFs cycle which operates as a batch process. This will preclude efficient application of wet scrubbing. Thus, the wet scrubber option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(2) Spray Dryer Absorption (SDA) -- An alternative to wet scrubbing is a process known as dry scrubbing, or spray-dryer absorption (SDA). As in wet scrubbing, the gas-phase SO_2 is removed by intimate contact with a suitable absorbing solution. Typically, this may be a solution of sodium carbonate (Na_2CO_3) or slaked lime [$Ca(OH)_2$]. In SDA systems the solution is pumped to rotary atomizers, which create a spray of very fine droplets. The droplets mix with the incoming SO_2-laden exhaust gas in a very large chamber and subsequent absorption leads to the formation of sulfites and sulfates within the droplets. Almost simultaneously, the sensible heat of the exhaust gas which enters the chamber evaporates the water in the droplets, forming a dry powder before the gas leaves the spray dryer. The temperature of the desulfurized gas stream leaving the spray dryer is now approximately 30 - 50 °F above its dew point.

The exhaust gas from the SDA system contains a particulate mixture which includes reacted products. Typically, baghouses employing Teflon-coated fiberglass bags (to minimize bag corrosion) are utilized to collect the precipitated particulates.

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[11] SO_2 and Acid Gas Controls, Sixth Edition, EPA/452/B-02-001

The SDA process would not have many of the potential operating problems associated with the wet scrubbing systems. The SO_2 concentration will vary widely over the SAFs cycle. Thus, SDA dry scrubbing option is considered technically infeasible for this application and will be not be considered any further in this BACT analysis.

(3) Dry Sorbent Injection (DSI) -- This control option typically involves the injection of dry powders into either the furnace or post-furnace region of utility-sized boilers. This process was developed as a lower cost option to conventional FGD technology. Since the sorbent is injected directly into the exhaust gas stream, the mixing offered by the dry scrubber tower is not realized.

The dry sorbent injection process would not have many of the potential operating problems associated with the wet scrubbing systems. The SO_2 concentration will vary widely over the SAFs cycle. The injection dose of sorbent materials would be hard to control in order to match variability in SO_2 concentrations. Similar control systems are fraught with chronic operational problems with the sensors requiring frequent maintenance and calibration.

Thus, DSI dry scrubbing option is considered technically infeasible for this application and will be not be considered any further in this BACT analysis.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

All control alternatives identified in Step 2 were eliminated as not technically feasible for controlling SO_2 emissions from the silicon production operations, with the exception of lower sulfur charge and good operating combustion practices.

Step 4 – Evaluate the Most Effective Controls and Document Results

Lower sulfur charge and good operating combustion practices were the only technically feasible control option in controlling SO_2 emissions from the SAF.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to submerged electric arc furnaces at silicon production plants:

Facility/	Permit Date	Process	SO_2 Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	Coke which exceeds the 1.7 lb/million Btu maximum and 1.4 lb/million Btu consecutive three month average, sulfur in fuel limits of 6NYCRR, Part 225-1.2 (d) Table 2 for solid fuel, may be used in combination with coal in the furnace charge on a minimum 4:1 coal/coke ratio. Globe is required to demonstrate that when using coke with a sulfur content greater than the allowable limit in combination with coal, the sulfur dioxide emissions will not exceed a maximum 3.4 pounds of sulfur dioxide per million Btu heat input and an average 2.8 pounds of sulfur dioxide per million Btu heat input. No control	
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	SO_2: 94 lb/hr Capacity: 20 MW/hr SO_2: 4.95 lbs/MW	No control
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	SO_2: 68.7 lb/hr Nominal Capacity: 2 tons/hr SO_2: 34.35 lbs/ton silicon	No controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	None	No controls

As shown in the above table, SO_2 emissions from SAFs are uncontrolled. None of the sources as reflected in the above table have proposed or successfully implemented any add-on control devices to control SO_2 emissions from SAFs operation.

MS Silicon is proposing the SO_2 BACT for the SAFs as follows:

- **Total SO_2 emissions from the SAF shall be limited to 52 lbs/ton (averaged over a 30-day period) of silicon produced; and**

- **Utilization of low sulfur content material, where technically feasible.**

4.6.3 BACT Analysis for SO_2 Emissions from Natural Gas Combustion (AA-202)

Natural Gas Combustion Sources – Includes the following:

- Ladle Pre-Heaters (4 – 10.0 MMBtu/hr): 0.10 tpy SO_2;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control SO_2 that is emitted at from small natural gas combustion units. See below table for summary of SO_2 BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	SO_2 BACT Limit	Controls
Lake Charles Cogeneration LLC LA-0231	06/22/09	BACT-PSD	34.20 MMBtu/hr Shift Reactor Startup Heater	0.0006 lb/MMBtu	Combustion of natural gas
Competitive Power Ventures MD-0040	11/12/08	BACT-PSD	1.70 MMBtu/hr Heater	No limit	Exclusive use natural gas with sulfur content not to exceed 2.0 gr/100 scf
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	13.30 MMBtu/hr Ladle Preheater and refractory drying	0.0006 lb/MMBtu	Combustion of natural gas
Thysenkrupp Steel and Stainless USA, LLC AL-0230	08/17/07	BACT PSD	33.40 MMBtu/hr Batch Annealing Furnaces	0.0006 lb/MMBtu	No control
Nucor Steel AR-0090	04/03/06	BACT-PSD	Ladle Dryer	0.0006 lb/MMBtu	No control

Facility/ RBLC ID	Permit Date	Basis	Process	SO_2 BACT Limit	Controls
Republic Engineered Products, Inc OH-0303	08/30/05	LAER	14.5 MMBtu/hr Ladle Dryers/Preheaters	0.0006 lb/MMBtu	Use of natural gas with sulfur content less than 0.6 % by weight
Charter Steel OH-0276	06/10/04	BACT-PSD	10 MMBtu/hr Ladle Preheater and Dryer, 4 Units	0.0006 lb/MMBtu	No controls
Nucor Steel IN-0090	01/19/01	BACT-PSD	15 MMBtu/hr Ladle Preheaters	No limit	Combustion of natural gas or propane

As shown in the above table, no add-on controls are used for SO_2 from the small natural gas combustion equipment.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar small natural gas combustion devices use fuel specifications and good combustion practices for controlling SO_2 emissions. No similar sized natural gas combustion devices were identified add-on SO_2 controls as BACT.

Thus, BACT is defined as combustion of clean fuel and good combustion practices. For the natural gas combustion sources associated with the proposed Plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of SO_2 control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

Thus, BACT for SO_2 emissions from natural gas combustion equipment to be utilized at the plant is defined as:

- **SO_2 emission rate of 0.0006 lbs/MMBtu;**
- **Combustion of clean fuel; and**
- **Good combustion practices.**

4.6.4 BACT Analysis for SO_2 Emissions from Emergency Equipment (AA-501)

Emergency Equipment – Includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP each): 0.2 tpy SO_2

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control SO_2 that is emitted at from emergency equipment. See below table for summary of SO_2 BACT determinations from the RBLC database:

Step 2 - Technical Feasibility of SO_2 Control Alternatives

The emergency diesel generator will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of SO_2 emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control SO_2 emissions from the emergency equipment, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing SO_2 BACT determinations for diesel fired emergency equipment. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	SO_2 BACT Limit	Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	No limit	No controls Engines will fire ULSD fuel oil or propane and each will be limited to 500 hours per year of operation during emergencies.

Facility/ RBLC ID	Permit Date	Process	SO_2 BACT Limit	Controls
Idaho Power Company ID-0018	6/25/10	Emergency Diesel Generator	No limit	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389	12/29/09	Emergency ULSD Generator	No limit	ULSD combustion, 500 hours of operation per year
Verenium (FL-0318)	12/10/09	Emergency generators	0.0015 % S	Comply with applicable provisions of 40 CFR 60, Subpart IIII
Lake Charles Cogeneration, LLC (LA-0231)	06/22/09	Emergency Diesel Power Generator Engines (1341 HP)	0.0100 lb/hr	Comply with 40 CFR 60 Subpart IIII
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	No limit	100 hours of operation per year, ULSD fuel, good combustion practices, EPA certified per NSPS IIII
		500 KW emergency generator	No limit	100 hours of operation per year, ULSD fuel, good combustion practices, EPA certified per NSPS IIII
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	0.89 lb/hr	Low sulfur diesel fuel < 0.05% S

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII; good combustion/operating practices, and the use of ultra-low sulfur diesel (ULSD) fuel.

Step 5 – Select BACT for SO_2 from Emergency Equipment

BACT for SO_2 emissions associated with the emergency equipment is proposed as compliance with NSPS IIII; good combustion/operating practices, and use of ULSD.

4.7 Best Available Control Technology (BACT) Analysis - Emissions of VOC

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of VOC emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes.

4.7.1 VOC Emission Sources Subject to Control Technology Evaluation

The VOC emission sources associated with the proposed plant that are included in this VOC BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces;
- Natural gas fired combustion equipment; and
- Emergency equipment.

For a summary of the estimated VOC emission rates for the sources identified above, please refer to the following table:

VOC Emission Rates for Sources Evaluated for BACT

Equipment Description	VOC Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnaces	92.5
Natural Gas Combustion Equipment • Ladle preheaters	0.9
Emergency Equipment: • Emergency Generator	0.08
Total	93.5

4.7.2 BACT Analysis for VOC Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling emissions from the semi-enclosed submerged electric arc furnaces:

1. On-line USEPA Control Technology Database; and
2. State Air Quality Permits

The following control technologies were identified and evaluated to control VOC emissions from the SAFs:

(a) Operating Practice Modifications;

(b) Flaring of VOC Emissions;

(c) VOC Oxidation Catalysts;

(d) Post-Combustion Reaction Chamber;

(e) Catalytic Incineration; and

(f) Oxygen Injection.

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing VOC emissions from the SAF. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative. MS Silicon is also proposing to utilize a semi-enclosed SAF design that will reduce the quantity of VOC generated during the furnace conversion process. Because of the nature of the furnace process and temperatures that will be achieved during the process, engineering literature suggests VOC emissions will be minimal. For purposes of this application we have conservatively assumed VOCs will be generated and have assigned an emission factor expressed in lbs/ton.

(a) Operating Practice Modifications -- Due to marketplace demands on the type of products to be manufactured and the required product quality, MS Silicon does not propose any additional operating practice modifications that will alter VOC emissions from the existing SAF. Therefore, this control option will be eliminated for further evaluation in this BACT analysis.

(b) Flaring of VOC Emissions -- Based upon a review of the previously listed information resources, there is no known application of flaring SAF exhaust gases. Flaring of emissions for VOC destruction would require raising the exhaust gas temperature. Thus, based on the relatively large gas volumetric flow at a substantial temperature differential, the auxiliary fuel requirements needed to operate the flare would be overwhelmingly large. Additionally, it can be speculated as to whether the flare would actually result in a decrease of VOC emissions or increase thereof from supplemental fuel combustion, which would also result in an increase of NO_x emissions and potential CO_2 emissions. Consequently, this control alternative is considered technically infeasible for SAF exhausts and thus, will not be considered any further in this BACT analysis.

(c) VOC Oxidation Catalysts -- Based upon a review of the previously listed information resources, there is no known application of VOC oxidation catalysts to control VOC emissions from a SAF. The optimal working temperature range for VOC oxidation catalysts is approximately 850 °F - 1,100 °F with a minimum exhaust gas stream temperature of 500 °F for minimally acceptable VOC control. Exhaust gases from the SAF will undergo rapid cooling as they are ducted from the furnace. Thus, the temperature will be far below the minimum 500 °F threshold for effective

operation of VOC oxidation catalysts. Additionally, the particulate loading in the exhaust gas stream is anticipated to be too high for efficient operation of a VOC oxidation catalyst. Masking effects such as plugging and coating of the catalyst surface would almost certainly result in impractical maintenance requirements, and would significantly degrade the performance of the catalyst. Consequently, this control alternative is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(d) Post-Combustion Reaction Chambers -- Based upon a review of the previously listed information resources, there is no known successful application of duct burners or thermal incinerators to control VOC emissions from silicon production operations. The feasibility of these units to effectively reduce VOC emissions, without resulting in severe operational problems, is unknown. Further, such units are expected to consume large quantities of natural gas and oxygen; resulting in excessive annual operating costs.

The principle of destruction within post combustion chambers is to raise the SAF exhaust gases to a sufficiently high temperature and for a minimum amount of time to facilitate oxidation. The combustion chamber configuration must provide effective mixing within the chamber with an acceptable residence time. Recuperative heat exchangers can be used with these systems to recover a portion of the exiting exhaust gas heat and reduce the auxiliary fuel consumption.

The amount of VOC which could be oxidized with post combustion systems is uncertain, and precise performance guarantees are expected to be difficult to obtain from equipment manufacturers because of the lack of operating experience. In addition, there is the potential for additional emissions of NO_x and CO_2 from auxiliary fuel combustion. Further, due to the heat and particulate loading, the burners would have a short life expectancy, and may sustain severe maintenance and reliability problems. Additionally, a single or multiple duct burner system would not be able to heat the relatively cool gases from the SAF during cold cycling. Potentially, there are two locations where post combustion chambers can be installed, i.e., upstream or downstream of an SAF baghouse. Locating upstream of the baghouse would take advantage of slightly elevated temperatures in the exhaust gas stream. However, at this location, the post combustion chamber would be subject to high particulate loading. The units would be expected to foul frequently from the particulate accumulation, and the burners would have severe maintenance and reliability problems. Thus, the installation of the post combustion chamber upstream of the baghouse is considered technically infeasible. Alternatively, the post combustion chamber could be installed downstream of the SAF baghouse. However, even at this location, fouling due to particulate matter can occur and more importantly, even cooler exhaust temperatures would be encountered. These cooler temperatures would greatly increase the auxiliary fuel requirements. Further, the combustion of additional fuel will result in increases in emissions to the atmosphere.

Based upon the above discussions, the use of a post combustion chamber is considered technically infeasible for the silicon production operations and will not be considered any further in this BACT analysis.

(e) Catalytic Incineration -- Based upon a review of the previously listed information resources, there is no known application of catalytic incineration to control VOC emissions from silicon production operations. Catalytic incinerators use a bed of catalyst that facilitates the overall combustion of combustible gases. The catalyst increases the reaction rate and allows the conversion of CO to CO_2 at lower temperatures than a thermal incinerator. The catalyst is typically a porous noble metal material which is supported in individual compartments within the unit. An auxiliary fuel-fired burner ahead of the bed heats the entering exhaust gases to 500 °F – 600 °F to maintain proper bed temperature. Recuperative heat exchangers are used to recover the exiting exhaust gas heat and reduce the auxiliary fuel consumption. Secondary energy recovery is typically 70 percent.

Catalytic incineration systems are limited in application due to potential poisoning, deactivation, and/or blinding of the catalyst. Lead, arsenic, vanadium, and phosphorus are generally considered poisons to catalysts and deactivate the available reaction sites on the catalyst surface. Particulate can also build up on the catalyst, effectively blocking the porous catalyst matrix and rendering the catalyst inactive. In cases of significant levels of poisoning compounds and particulate loading, catalyst replacement costs are significant.

As in the thermal incineration discussion, potentially, there are two locations where the incinerator can be installed, i.e., upstream or downstream of the SAF baghouse. For the same reasons discussed earlier (e.g., fouling due to particulate matter), the upstream location is considered technically infeasible. Alternatively, the incinerator can be installed downstream of the meltshop baghouse. However, even at this location, fouling due to particulate matter can occur, and further, the exhaust will be at a lower temperature. These cooler temperatures would greatly increase the auxiliary fuel requirements. The associated combustion of additional auxiliary fuel will result in an unacceptable increase in operating costs. Further, the combustion of additional fuel will result in increases in emissions to the atmosphere.

Due to the lack of application of catalytic incineration for SAFs and potentially adverse technology applicability issues, this control alternative is considered technically infeasible and will not be considered any further in this BACT analysis.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

All control alternatives identified in Step 2 were eliminated as not technically feasible for controlling VOC emissions from the SAF.

Step 4 – Evaluate the Most Effective Controls and Document Results

Good operating practices are only technically feasible control option in controlling VOC emissions from the SAF.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to submerged electric arc furnaces at silicon production plants:

Facility/ RBLC ID	Permit Date	Process	VOC Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	No limit	No control
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	VOC: 5.7 lb/hr Capacity: 20 MW/hr VOC: 0.29 lbs/MW	No control
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	VOC: 4.15 lb/hr Nominal Capacity: 2 tons/hr	No controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	None	No controls

As shown in the above table, VOC emissions from submerged electric arc furnaces are uncontrolled. None of the sources as reflected in the above table have proposed or successfully implemented any add-on control devices to control VOC emissions from SAF operation.

MS Silicon is proposing the BACT for VOC from the SAFs as follows:

- **Good operating practices; and**
- **Total VOC emissions from the SAF shall be limited to 2.4 lbs/ton (averaged over a 30-day period) of silicon produced.**

4.7.3 BACT Analysis for VOC Emissions from Natural Gas Combustion (AA-202)

Natural Gas Combustion Sources – Includes the following:

- Ladle Pre-Heaters (4 – 100 MMBtu/hr): 0.9 tpy VOC;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control VOC that is emitted in small quantities from each combustion unit. See below table for summary of VOC BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	VOC BACT Limit	Controls
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	Ladle Preheater and refractory drying	0.0055 lb/MMBtu (total)	Combustion of natural gas
Nucor Steel AR-0090	04-03/06	BACT-PSD	Ladle Dryer	0.0006 lb/MMBtu	Good combustion practice
Republic Engineered Products, Inc OH-0303	08030/05	LAER	Ladle Dryers/Preheaters	5.5 lb/mmscf	Best operational and engineering practices, good combustion practices
Charter Manufacturing Co. Inc. Charter Steel OH-0276	06/10/04	BACT-PSD	Ladle Preheater and Dryers	0.005 lb/MMBtu	No controls

As shown in the above table, no add-on controls are used for VOC control from the small natural gas combustion equipment at ferroalloy facilities.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling VOC emissions. No similar sized natural gas combustion devices were identified as using add-on VOC controls as BACT.

Thus, BACT is defined as combustion of clean fuel and good combustion practices. For the natural gas combustion sources associated with the proposed plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of VOC control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

BACT for the VOC emissions from small natural gas combustion devices to be used to support the silicon manufacturing processes is as follows:

- **Combustion of natural gas;**
- **Good operating practices; and**
- **Total VOC emission limit of 0.0055 lb/MMBtu (AP-42 Emission Factor).**

4.7.4 BACT Analysis for VOC Emissions from Emergency Equipment (AA-501)

Emergency Equipment – Includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP each): 0.27 tpy VOC.

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control VOC that is emitted at from each piece of emergency equipment. See below table for summary of VOC BACT determinations from the RBLC database:

Step 2 - Technical Feasibility of VOC Control Alternatives

The emergency diesel generator will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of VOC emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control VOC emissions from the emergency equipment, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing VOC BACT determinations for diesel fired emergency equipment. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	VOC BACT Limit	Add-On Controls
Idaho Power Company ID-0018	6/25/10	750 KW Emergency Diesel Generator	6.4 G/KW-H	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389)	12/29/09	2000 KW Emergency ULSD Generator	6.4 G/KW-H	Engine design and operation
Verenium (FL-0318)	12/10/09	2000 KW Emergency generators	6.4 G/KW-H	The emergency generator and fire pumps are both an Emergency Stationary Compression Ignition Internal Combustion Engine (Stationary ICE) and shall comply with applicable provisions of 40 CFR 60, Subpart IIII
		Emergency ULSD Fired Pump	3.0 g/hp-hr	
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	1.55 lb/hr	Good combustion practices
		267 HP low sulfur diesel emergency fir pump	0.66 lbs/hr	Good combustion practices

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII and good combustion/operating practices

Step 5 – Select BACT for VOC from Emergency Equipment

BACT for VOC emissions from the emergency equipment is proposed as:

- **Compliance with NSPS IIII; and**
- **Good combustion/operating practices.**

4.8 Summary of BACT Evaluation

As shown in this BACT evaluation, BACT is being proposed for each regulated air pollutant associated with the equipment/operations at the proposed plant. The emission limitations provided in Tables 4-1 through 4-6 represent BACT taking into account BACT limits established for recently permitted similar operations.

Section 5: Air Quality Impact Evaluation

As stated in the Code of Federal Regulations (40 CFR 52) and MDEQ rule APC-S-5, any application for a permit under the PSD provisions shall contain an analysis of ambient air quality in the area that the major project would affect. This requirement only applies to those air pollutants that would trigger PSD applicability (i.e., PSD review).

The proposed plant will be subject to PSD review for emissions of PM_{10}, $PM_{2.5}$, NO_x, CO and SO_2. It is therefore necessary to determine if the proposed plant will have a significant impact on ambient air quality, defined by predicted impacts in excess of a Significant Impact Level (SIL). If the proposed plant has a significant impact on ambient air quality, then a demonstration of compliance with the National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration (PSD) Class II increments will be performed for those pollutants that have a significant impact on ambient air quality. The following subsections present the air quality impact analysis for emissions of PM_{10}, $PM_{2.5}$, NO_x, CO and SO_2 as a result of the proposed plant.

An ozone impact analysis is required if VOC emissions from the proposed plant are more than 100 tons/year. Since VOC emissions from the proposed plant will be below 100 tons/year, an air quality impact evaluation is not required, which is consistent with federal and state PSD requirements.

A detailed description of the modeling approach and data requirements for the assessment of air quality impacts due to the proposed plant is included in this section. Currently, the analyses to estimate whether or not the project will have impacts in excess of the SILs or in excess of the Significant Monitoring Concentrations (SMCs) have been completed. It is our understanding that this project will be the first PSD permit in Tishomingo County. As a result, for each air pollutant that results in a significant impact, the corresponding PSD minor source date will be triggered. Subsequently, the proposed plant will be the only PSD Class II Increment consuming source. The results obtained from evaluating compliance with the PSD Class II Increments are provided as part of this application. Any required multisource impact analyses for demonstration of compliance with the NAAQS are pending. The results of such multisource impact analyses will be provided as an addendum to this document in the near future.

5.1 Selected Air Dispersion Model for the Project

The most recent version of the U.S. EPA regulatory model AERMOD (Version 11103), developed by The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) was utilized for this project. Regulatory default options available in the model will be used for the compliance demonstrations.

BREEZE AERMOD was used to prepare the input for and process the output from AERMOD. BREEZE AERMOD provides a graphical interface with geographic information system (GIS) capabilities to enhance the AERMOD model and aid the user with setting up the AERMOD input file and organizing and evaluating AERMOD output files. The U.S. EPA's approved regulatory AERMOD code which is used to predict ambient concentrations is unaltered by BREEZE AERMOD.

The AERMOD model family consists of several supporting pre-processor models. The following list summarizes the versions of AERMOD family software that were used for this air dispersion modeling analysis:

- AERMOD 11103;
- Building Profile Input Program for PRIME (BPIPPRM 04274); and
- AERMAP 11103.

5.2 Model Input and Support Data

Several data elements are required as input to support the dispersion model AERMOD, including:

- Representative hourly meteorological data;
- Potential points of predicted impacts, referred to as receptor points; and
- Terrain elevations for each individual receptor point.

Each of these data elements are discussed in the subsequent sections of this protocol.

5.3 Meteorological Data Selection and Pre-processing

MDEQ provides AERMOD View-ready meteorological (met) data sets consisting of five years of met data on their web site at the following url:

http://www.deq.state.ms.us/MDEQ.nsf/page/epd_AERMET_Preprocessedmetdata?OpenDocument

The North East Region met data set with surface data from the Tupelo Regional Airport and upper air data from Jackson provided by MDEQ is considered representative of the Project site. The met data was processed with AERMET View. The most recent five years of the met data, 2007 through 2011, was used for this air dispersion modeling project.

5.4 Coordinate System and Receptor Network

The AERMOD model objects were located using the Universal Transverse Mercator (UTM) coordinate system and North American Datum of 1983 (NAD83).

The receptor grid was designed to identify the maximum points of air quality impact due to the proposed plant and consisted of receptors extending to 50 kilometers from the proposed plant site. The ambient air boundary is defined by features which preclude public access from the plant site. Receptors were closely spaced (50 meters) along the proposed plant site's ambient air boundary to identify the influence of aerodynamic building downwash. The following receptor spacing was used for the receptor grid:

- 50-meter spacing along the ambient air boundary of the proposed plant site;

- 100-meter spacing from the proposed plant fence line to two kilometers out from the proposed plant site;
- 500-meter spacing from two kilometers to five kilometers from the proposed plant site;
- 1,000-meter spacing from five kilometers to ten kilometers from the proposed plant site; and
- 2,000-meter spacing from ten kilometers to fifty kilometers from the proposed plant site.

Figures 5-1 and Figure 5-2 present the receptor network used in the analysis.

5.5 Terrain Data Selection and Pre-processing

Terrain data was assigned to the receptor networks using the latest version of AERMAP (11103) and national elevation data (NED) files at 1-arc second resolution obtained from the United States Geological Survey (USGS) seamless data warehouse server. The elevation of buildings and sources on the site were based upon the planned finished grading of the site.

5.6 Project Emission Inventory

The emission inventory of the plant was based on the potential to emit emission rates provided in this air permit application to construct. The inventory is described in detail in Section 2.0 of this application with supporting backup calculations.

The emission inventory associated with the proposed plant is provided in Table 5-4, Table 5-5, and Table 5-6. AERMOD model objects – buildings, stacks, receptors on the fence line of the site – are depicted in Figure 5-3 and Figure 5-4.

5.7 Determination of the Significance of Project Contributions to Ambient Air Concentrations and Requirement for Pre-Construction Monitoring

The inventory of the proposed plant air emissions was modeled, and the predicted ambient air concentrations were compared with the PSD Class II SILs and the SMCs.

If the predicted concentrations are less than the SILs, the project is demonstrated to not cause or contribute to a violation of the NAAQS or PSD Class II Increments. If predicted concentrations exceed the SILs, further modeling is required to demonstrate that the project will not cause or contribute to a violation of the NAAQS or PSD Class II Increments. The significant impact area (SIA) is defined as the set of receptors at which predicted concentrations due to emissions from the plant are predicted to equal or exceed the SIL.

If the predicted concentrations are less than the SMCs, the plant will be exempt from the requirements to conduct pre or post construction monitoring under the PSD program. The statistical form of the modeled concentration is based on a 5-year National Weather Service met data set.

Tables 5-4a and 5-4b provides a summary of model predicted ambient air concentrations due to the plant and applicable SILs and SMCs. The statistical form of the modeled concentrations indicated in the footnotes of the table is based on a 5-year National Weather Service met data set. The predicted concentrations are appropriate for comparison with the SILs and SMCs.

The plant is predicted to contribute significantly to ambient air quality impacts for 24-hour and annual average PM_{10}, 24-hour and annual average $PM_{2.5}$, annual average, 1-hour, 3-hour and 24-hour SO_2, and 1-hour and annual average NO_2. The SIA distance for these criteria pollutants and averaging periods is provided in Tables 5-4a through 5-4d. Multisource impact analyses for each of these air pollutants to demonstrate compliance with the corresponding NAAQS is currently underway and will be provided to MDEQ as an addendum to this application under separate cover. The plant was predicted to result in predicted concentrations of emissions of CO below the 1-hour and 8-hour SILs, thus no multisource modeling analysis was required. The proposed plant will be below the corresponding NAAQS for emissions of CO.

5.8 Air Quality Monitoring

In addition to the requirement to conduct an air quality impact analysis, the PSD requirements also stipulate that an analysis be performed to assess ambient air quality for a pollutant in any area that the emission of that pollutant would affect.

To assess the ambient air quality from the proposed plant, an air quality impact assessment is typically performed and the predicted impacts are compared to the Significant Monitoring Concentration (SMC). However, for emissions of VOC, no SMC has been developed by USEPA.

If modeled concentrations are below the SMCs, then the requirement for pre- and post-construction monitoring is typically waived. Table 5-4b provides a comparison of the maximum predicted PM_{10}, $PM_{2.5}$, NO_2, SO_2, and CO concentrations, respectively, due to emissions from the proposed plant with the SMCs. Predicted PM_{10} and $PM_{2.5}$ concentrations are above the SMCs, and predicted NO_2, CO and SO_2 concentrations are below the SMCs.

Based on past discussions with MDEQ, it was concluded that sufficient ambient monitoring has been performed throughout the state of Mississippi and that the requirement to conduct any preconstruction or post construction monitoring for emissions of PM_{10}, $PM_{2.5}$, NO_2, CO and SO_2 will not be required by MDEQ. Thus, the requirement to conduct ambient monitoring is being waived by MDEQ.

5.9 PSD Class II Increment Compliance Demonstration

The PM_{10}, $PM_{2.5}$, SO_2 and NO_2 PSD Class II increment compliance demonstrations did not require preparation of a multisource air modeling inventory because the MS Silicon project sources are the only PSD increment consuming source for these regulated air pollutants, being the first major source of these air pollutants to go through PSD review in the area since the increment was established. The results of the air dispersion modeling, which indicates that the MS Silicon plant will be in compliance with the PSD Class II increments, are provided in Table 5-4c.

5.10 NAAQS Compliance Demonstration

As mentioned in the introduction provided in Section 5.0, a multisource NAAQS analysis is currently ongoing. The results of that analysis will be provided to the MDEQ as an addendum to this application. It should be noted, as summarized in Table 5-4d, the proposed plant's emissions of regulated air pollutants will result in predicted concentrations below the NAAQS. As a result, the proposed plant will not cause an impact to human health and welfare.

Section 6: Additional Impact Analysis

The potential impact of the proposed silicon manufacturing plant's air pollutant emissions associated with construction and related growth are presented in this section. Assessment of the proposed plant's impact on soil, vegetation, and visibility are also presented in this section. A qualitative approach to these analyses was necessary for those areas in which analytical techniques are not well established.

6.1 Construction and Growth Impacts

The project being proposed by MS Silicon will have minimal effect on construction and growth impacts. During the construction phase, MS Silicon will employ various techniques to minimize the potential impact on the surrounding environment. The primary focus will be to reduce the formation of fugitive type particulates that may be generated during the construction phase.

The construction and operation of the proposed silicon manufacturing plant should not result in any noticeable residential growth in the area. Commercial growth is anticipated to occur at a gradual rate in the future. However, this growth will not be directly associated with the proposed plant in Tishomingo County.

6.2 Impact on Soil and Vegetation

The secondary NAAQS are intended to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings from adverse effects of airborne pollutants. This protection extends to agricultural soil. As demonstrated in Section 5, predicted concentrations of PM_{10}, $PM_{2.5}$, NO_2, CO and SO_2 resulting from the proposed plant will not cause or contribute to a violation of the NAAQS. Since the secondary NAAQS were established to protect human welfare, no significant adverse impacts on soil are anticipated due to the proposed plant in Tishomingo County.

The effects of gaseous air pollutants on vegetation may be classified into three rather broad categories: acute, chronic, and long-term. Acute effects are those that result from relatively short (less than 1 month) exposures to high concentrations of pollutants. Chronic effects occur when organisms are exposed for months or even years to certain threshold levels of pollutants. Long-term effects include abnormal changes in ecosystems and subtle physiological alterations in organisms. Acute and chronic effects are caused by the gaseous pollutant acting directly on the organism, whereas long-term effects may be indirectly caused by secondary agents such as changes in soil pH.

NO_2 may affect vegetation either by direct contact of NO_2 with the leaf surface or by solution in water drops, becoming nitric acid. Acute and chronic threshold injury levels for NO_2 are much higher than those for SO_2.

The maximum predicted NO_2 ambient concentrations due to the proposed silicon manufacturing plant are below the ambient air quality standards, which are designed to protect public health and welfare from any known or adverse effect of air pollutants, including effects on vegetation.

6.3 Analysis of Endangered Species

Potential emissions of regulated criteria pollutants associated with the proposed plant are presented in Section 2.0 of this PSD air permit application. An air quality impact analysis was performed for emissions of PM_{10}, $PM_{2.5}$, NO_2, CO and SO_2. As shown in Section 5.0, emissions of PM_{10}, $PM_{2.5}$, NO_2, CO and SO_2 from the proposed plant will result in potential impacts below the NAAQS that protect human health and welfare.

MS Silicon's facility will be located in Tishomingo County, Mississippi. It is possible there may be endangered species located in Tishomingo County. However, as stated above, air emissions resulting from the proposed plant result in model predicted concentrations below the NAAQS. Therefore, these emissions are not expected to have a significant impact on endangered species which may be present in the county. In addition, maximum impacts from the proposed plant are in the immediate vicinity of the plant and it is unlikely due to the location of the proposed plant that endangered species would reside in these maximum impact areas. Table 6-1a presents the U.S. Fish & Wildlife Service's listing of threatened and endangered species in the State of Mississippi and Table 6-1b presents the list of threatened and endangered species in Tishomingo County.

6.4 Additional Air Quality Impact Analyses

As stipulated in the PSD regulations (40 CFR 52.21(o)) analysis of the impairment that would occur as a result of the proposed silicon manufacturing plant must be conducted. A discussion on this analysis as it relates to the proposed plant is provided below.

6.4.1 Impact on Visibility (Regional Haze Analysis)

As stated previously, the proposed plant will trigger applicability of the PSD regulations. One of the components of the PSD regulations includes the special protection of air quality and air quality related values (AQRV) at potentially affected nearby Class I areas. Assessment of the potential impact to visibility (regional haze analysis) is required if the source is located within 300 km of a Class I area. An evaluation may also be requested if the source's emissions are of sufficient size.

The nearest Class I area to the proposed plant site is identified below:

Class I Area	State	Approximate Distance (Project Site to Class I Area) (km)
Sipsey Wilderness Area	Alabama	100

Figure 6-1 presents the location of the proposed plant in Tishomingo County, Mississippi in relation to the Sipsey Wilderness Class I Area in northern Alabama.

The largest source of regulated air pollutants will occur from the plant's SAFs. As mentioned previously, the SAFs will be installed in phases and will be designed with a baghouse to minimize $PM_{10}/PM_{2.5}$ emissions prior to the associated exhaust gases exiting a 300 foot stack. Predicted concentrations of PM, NO_2 and SO_2 significantly drop with downwind distance from this plant. All other potential emission sources have been shown to result in their maximum concentrations at the property fence line or within one (1) kilometer of the proposed plant based on the configuration of the plant and being located east of the proposed plant site (not downwind of the plant based on the area's predominant wind flow south to north, and southwest to northeast), the proposed plant should have no effect on visibility impairment or resulting concentrations above the Class I increments.

The USDA Forest Service has requested that an AQRV Modeling Analysis for Sipsey Wilderness be included in the PSD permit application. The results of this analysis will be submitted as an addendum to this application upon completion.

Section 7: Suggested Permit Structure

Refer to the following tables for suggested permit language:

- Table 7-1 – Proposed Permit Conditions – Part II – Emission Point Descriptions;
- Table 7-2 – Proposed Permit Conditions – Part III – Emission Point Specific Limitations and Standards;
- Table 7-3 – Proposed Permit Conditions – Part IV – Emission Point Specific Compliance / Performance Requirements; and
- Table 7-4 – Proposed Permit Conditions – Part V – Emission Point Specific Recordkeeping / Reporting Requirements

Section 8: MDEQ Application Forms

Included in this Section are the relevant application forms that are required to accompany a request for a construction permit. The follow forms are provided in Appendix A:

- General Form;
- Additional Information Required for Applications, Existing Source Operating Permits, and for Approval to Construct;
- Emission Summary Section – Part I Stack Parameters;
- Emission Summary Section – Part II Regulated Air Pollutant Emission Rates;
- Emission Summary Section – Part III Regulated Hazardous Air Pollutant Emission Rates;
- Application Summary Section;
- Fuel Burning Equipment;
- Manufacturing Process Operations;
- Tank Summary; and
- L4 - Air Pollution Control Devices – Baghouse.

For purpose of streamlining the application, the forms make reference to tables within the application that provide the required information.

Appendix A - MDEQ Application Forms

The follow forms are provided in Appendix A:

- General Form;
- Additional Information Required for Applications, Existing Source Operating Permits, and for Approval to Construct;
- Emission Summary Section – Part I Stack Parameters;
- Emission Summary Section – Part II Regulated Air Pollutant Emission Rates;
- Emission Summary Section – Part III Regulated Hazardous Air Pollutant Emission Rates;
- Application Summary Section;
- Fuel Burning Equipment;
- Manufacturing Process Operations;
- Tank Summary; and
- L4 - Air Pollution Control Devices – Baghouse.

For purpose of streamlining the application, the forms make reference to tables within the application that provide the required information.

Appendix B - Air Quality Impact Evaluation – AERMOD Output Files - CO

Air Quality Impact Evaluation – AERMOD Output Files

Pollutant – CO

Years – 2007 through 2011

Appendix B - Air Quality Impact Evaluation – AERMOD Output Files – NO2

Air Quality Impact Evaluation – AERMOD Output Files

Pollutant – NO_2

Years – 2007 through 2011

Appendix B - Air Quality Impact Evaluation – AERMOD Output Files – PM10

Air Quality Impact Evaluation – AERMOD Output Files

Pollutant – PM_{10}

Years – 2007 through 2011

Appendix B - Air Quality Impact Evaluation – AERMOD Output Files – $PM_{2.5}$

Air Quality Impact Evaluation – AERMOD Output Files

Pollutant – $PM_{2.5}$

Years – 2007 through 2011

Appendix B - Air Quality Impact Evaluation – AERMOD Output Files – SO_2

Air Quality Impact Evaluation – AERMOD Output Files

Pollutant – SO_2

Years – 2007 through 2011

Table 2-1
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Emission Sources

Emission Point ID	Description	Control Device ID*	Control Device Description*	Regulated Air Pollutants	Stack ID	Emission Point Description	Table Containing Emission Estimates
AA-000	**Silicon Manufacturing Plant**						
AA-100	**Raw Material Receiving, Handling and Storage Operations**						
AA-101	Material Handling and Transfer to and from Coal Storage Pile	--	--	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Table 2-4
AA-101a	Conveyance of Coal to Charging Storage Silo	BG5	Baghouse	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Table 2-4a
AA-102	Material Handling and Transfer to and from Wood Storage Pile	--	--	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Table 2-4
AA-102a	Conveyance of Wood to Charging Storage Silo	BG5	Baghouse	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Table 2-4a
AA-102b	Wood Chipper	--	--	PM/PM10/PM2.5	--	Material Storage and Conveyance - Fugitive	Table 2-4b
AA-103	Material Handling and Transfer to and from Quartz Storage Pile	--	--	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Table 2-4
AA-103a	Conveyance of Quartz to Charging Storage Silo	BG5	Baghouse	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Table 2-4a
AA-104	Material Handling and Transfer to and from Limestone Storage Pile	--	--	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Table 2-4
AA-105	Storage Piles Processing (i.e., Bulldozing)	--	--	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Table 2-5
AA-106	Wind Erosion on Coal, Wood and Quartz Storage Piles	--	--	$PM/PM_{10}/PM_{2.5}$	--	Material Storage and Conveyance - Fugitive	Tables 2-7a, 2-7b & 2-7c
AA-200	**Silicon Manufacturing Plant**						
AA-201	Four (4) Submerged Arc Furnaces with Baghouse Control Device	BG1, BG2, BG3, BG4	Baghouse	NO_x, CO, SO_2, VOC, $PM/PM_{10}/PM_{2.5}$, HAPs, GHGs	ST-SAFBG1 thru ST-SAFBG4	SAF - Point; Baghouse - Point	Tables 2-2a, 2-2b, 2-2c & 2-2d
AA-201a	Casting Frames	--	--	$PM/PM_{10}/PM_{2.5}$	--	Casting Frames - Point	Table 2-2e
AA-202	Four (4) Natural Gas-Fired Ladle Preheaters (2 ton ladle capacity)	--	--	NO_x, CO, SO_2, VOC, $PM/PM_{10}/PM_{2.5}$, HAPs, GHGs	--	Natural Gas-Fired Ladle Preheaters - Indoor Fugitive	Tables 2-3a, 2-3b & 2-3c
AA-300	**Product Refinement and Handling**						
AA-301	Silicon Grinding & Milling Operations	BG6	Baghouse	PM/PM10/PM2.5	--	Material Storage and Conveyance - Fugitive	Table 2-4a
AA-400	**Other Plantwide Operations and Activities**						
AA-401	One (1) Oxygen Vertical Storage Tanks and One (1) Diesel Storage Tank	--	--		--	Storage Tanks - Point	--
AA-402	Plantwide Fugitive Emissions from Roadways	--	--	$PM/PM_{10}/PM_{2.5}$	--	Gravel Roads - Fugitive	Table 2-6
AA-402a	Plantwide Fugitive Emissions from Transport of Raw Materials (Material Storage Piles to SAF Charging Building)	--	--	$PM/PM_{10}/PM_{2.5}$	--	Paved Roads - Fugitive	Table 2-6a
AA-403	Slag Handling and Storage	--	--	$PM/PM_{10}/PM_{2.6}$	--	Slag Handling and Storage - Fugitive	Table 2-4c and 2-7d
AA-404	Silica Fume Silos	--	--	$PM/PM_{10}/PM_{2.6}$	--	Silica Fume Silos - Fugitive	Table 2-4d
AA-405	Facility-Wide Miscellaneous Operations	--	--	--	--	--	--
AA-500	**Emergency Support Equipment**						
AA-501	One (1) Diesel-Fired Emergency Generator	--	--	NO_x, CO, SO_2, VOC, $PM/PM_{10}/PM_{2.5}$, HAPs, GHGs	ST-EGEN1	Emergency Generator - Point	Tables 2-8 and 2-8a

Notes:
*Operations with no specific add-on control devices listed will utilize best management and operational practices to minimize excessive regulated air pollutant emission rates.

Table 2-1a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Emission Source and Stack Information

Point Sources

EMISSION POINT INFORMATION			Stack Parameters							
			Stack Height		Stack Data					
AERMOD Source ID	Emission Point ID	Description	(meters)	(feet)	Diameter (meters)	Diameter (feet)	Velocity (meters/second)	Velocity (feet/second)	Temp (°K)	Temp (°F)
SAF1	AA-201	Four (4) Submerged Arc Furnaces with Baghouse Control Device	91.44	300	1.93	6.3	19.37	63.5	449.82	350.01
SAF2			91.44	300	1.93	6.3	19.37	63.5	449.82	350.01
SAF3			91.44	300	1.93	6.3	19.37	63.5	449.82	350.01
SAF4			91.44	300	1.93	6.3	19.37	63.5	449.82	350.01
RM1	BG5*	Raw Material Baghouse	12.19	40.0	1.37	4.5	18.29	60.0	293.15	68
RM2			24.384	80.0	1.37	4.5	18.29	60.0	293.15	68
PR1	BG6**	Product Refinement & Handling Baghouse	12.19	40.0	1.07	3.5	18.29	60.0	293.15	68
PR2			24.384	80.0	1.07	3.5	18.29	60.0	293.15	68

Notes:

*Emission units AA-101a, AA-102a, AA-103a exhaust to this baghouse

**Emission unit AA-301 exhauast to this baghouse

Volume Sources

EMISSION POINT INFORMATION			Parameters					
AERMOD Source ID	Emission Point ID	Description	Height (meters)	Height (feet)	Initial SY (meters)	Initial SZ (meters)	Initial SY (feet)	Initial SZ (feet)
F1	AA-202	Four (4) Natural Gas-Fired Ladle Preheaters	20.01	65.6	6.97	18.62	22.9	61.1
F2			20.01	65.6	6.97	18.62	22.9	61.1
CF1	AA-201a	Casting Frames	14.00	45.9	5.61	13.02	18.4	42.7
CF2			14.00	45.9	5.61	6.51	18.4	21.4

Aera Sources

EMISSION POINT INFORMATION			Parameters					
AERMOD Source ID	Emission Point ID	Description	Height (meters)	Height (feet)	Y-Dim of Area (meters)	X-Dim of Area (meters)	Y-Dim of Area (feet)	X-Dim of Area (feet)
C1	AA-102b	Wood Chipper	3.05	10.0	6.10	6.10	20.0	20.0
PA	--	Process Area	9.14	30.0	229.66	339.73	753.5	1114.6
SP	--	Pile Storage Area	9.14	30.0	166.03	105.72	544.7	346.9

Table 2-2a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Submerged Arc Furnace (SAF) (Criteria Air Pollutants)

Submerged Arc Furnace

Emission Unit / Equipment Description	Emission Unit / Equipment ID	Emission Point ID	Maximum Throughput (tons/hour)	Maximum Throughput (tons/year)	Air Contaminant Emissions*									
					PM		PM_{10}		$PM_{2.5}$		SO_2		NO_x	
					lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
Submerged Arc Furnace 1	SAF	AA-201	2.75	21,024	3.49	15.30	3.49	15.30	3.49	15.30	141.900	542.42	123.75	473.04
Submerged Arc Furnace 2	SAF	AA-201	2.75	21,024	3.49	15.30	3.49	15.30	3.49	15.30	141.900	542.42	123.75	473.04
Submerged Arc Furnace 3	SAF	AA-201	2.75	21,024	3.49	15.30	3.49	15.30	3.49	15.30	141.900	542.42	123.75	473.04
Submerged Arc Furnace 4	SAF	AA-201	2.75	21,024	3.49	15.30	3.49	15.30	3.49	15.30	141.900	542.42	123.75	473.04
TOTAL	SAF	AA-201	11.0	84,096	13.97	61.18	13.97	61.18	13.97	61.18	567.60	2169.68	495.00	1892.16

Maximum Hours per Year = 8,760
Baghouse scf/min = 81,481
Baghouse acfm/min= 125,000

Example Calculations

Emissions (lbs/hr) = Emission Factor (lb/ton Si) * Maximum Throughput (tons/hr)
Emissions(tons/year) = PM Emissions (lbs/hr) * Maximum Hours per Year / 2000

$PM/PM_{10}/PM_{2.5}$ Emissions (lbs/hr) = Emission Factor (gr/scf) * Baghouse Flow Rate (dscf/min) * 60 / 7000
$PM/PM_{10}/PM_{2.5}$ Emissions(tons/year) = PM Emissions (lbs/hr) * Maximum Hours per Year / 2000

Notes:

*Potential emissions of non-criteria air pollutants were based on the assumption that the combustion components of coal and wood would also occur during the operation of the arc furnace

**Conversion of SO_2 to H_2SO_4 assumed to be negligible

Emission Factors Based on Engineering Estimate or Vendor Guarantee

PM (gr/scf)	PM_{10} (gr/scf)	$PM_{2.5}$ (gr/scf)	SO_2 (lbs/ton Silicon)	NO_x (lbs/ton Silicon)	VOC (lbs/ton Silicon)	CO (lbs/ton Silicon)
0.005	0.005	0.005	52	45	2.2	34

Emission Factor Notes:
Emission factors based on engineering estimates or vendor guarantee.
1) $PM/PM_{10}/PM_{2.5}$ based on vendor emissions data for proposed baghouse control device
2) NO_x, SO_2, VOC, CO and SO_2 based on engineering estimate

Table 2-2b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Submerged Arc Furnace (SAF) (Greenhouse Gases)

Material	Hourly Mass (tons/hr)	Annual Mass (tons/year)	Annual Mass (metric tons/year)	Carbon Content (Weight %)	Total Carbon Content (tons/yr)
Inputs to Submerged Arc Furnace					
Carbonaceous Materials - Coal Charged to the Furnace	3.4	26,280	23,840.81	60%	15,768.00
Carbonaceous Materials - Wood Charged to the Furnace	7.0	53,191	48,253.81	20%	10,638.14
Carbonaceous Materials - Quartz Charged to the Furnace	7.0	53,191	48,253.81	1%	531.91
Flux Materials Charged to the Furnace	0.1	876	794.69	5%	43.80
Total Input to Submerged Arc Furnace	**17.45**	**133,537.44**	**121,143.13**	--	**26,981.85**
Outputs from Submerged Arc Furnace					
Slag Produced by the Furnace	0.1	695	630.72	10%	69.52
Air Pollution Control Residue Collected	1	8,760	7,946.94	10%	876.00
Total Output from Submerged Arc Furnace	**1.09**	**9,455.25**	**8,577.66**	--	**945.52**

Example Calculation
CO_2 Emissions (tons/yr) = Annual Mass (tons/yr) * Carbon Content (Weight %) * (44/12)

Annual GHG Calculation (By GHG Rule Eq. Q-5)

Carbon Content Input (tons/year)	Carbon Content Output (tons/year)	Carbon Emissions (tons/year)	CO_2 Emissions (tons/year)	CO_2 Global Warming Potential	CO_2e Emissions (tons/year)	CO_2e Emissions (metric tons/year)	CO_2e Emissions - 6 SAF (tons/year)	CO_2e Emissions - 6 SAF (metric tons/year)
26,981.85	945.52	26,036.33	95,466.53	1.00	95,466.53	86,605.88	381,866.12	346,423.53

Calculation Method (GHG Rule Equation Q-5):
$CO_2 = 44/12 * [(Coal) * (C_{Coal}) + (Charcoal) * (C_{Charcoal}) + (Wood) * (CWood) + (Quartz) * (CQuartz) + (Flux) * (C_{Flux}) + Electrode * (C_{Electrode}) - (Slag) * (C_{Slag}) - (R) * (C_R)]$

Where:

CO_2 = Annual CO_2 mass emissions from the EAF (metric tons).
44/12 = Ratio of molecular weights, CO_2 to carbon.
(Coal) = Annual mass of coal (if any) charged to the furnace (metric tons).
(C_{Coal}) = Carbon content of the direct reduced iron, from the carbon analysis results (percent by weight, expressed as a decimal fraction).
(Charcoal) = Annual mass of charcoal charged to the furnace (metric tons).
($C_{Charcoal}$) = Carbon content of the charcoal, from the carbon analysis results (percent by weight, expressed as a decimal fraction).
(Wood) = Annual mass of wood charged to the furnace (metric tons).
(C_{Wood}) = Carbon content of the wood, from the carbon analysis results (percent by weight, expressed as a decimal fraction).
(Quartz) = Annual mass of quartz charged to the furnace (metric tons).
(C_{Quartz}) = Carbon content of the quartz, from the carbon analysis results (percent by weight, expressed as a decimal fraction).
(Flux) = Annual mass of flux materials (e.g., limestone, dolomite) charged to the furnace (metric tons).
(C_{Flux}) = Carbon content of the flux materials, from the carbon analysis results (percent by weight, expressed as a decimal fraction).
(Electrode) = Annual mass of carbon electrode consumed (metric tons).
($C_{Electrode}$) = Carbon content of the carbon electrode, from the carbon analysis results (percent by weight, expressed as a decimal fraction).
(Slag) = Annual mass of slag produced by the furnace (metric tons).
(C_{Slag}) = Carbon content of the slag, from the carbon analysis results (percent by weight, expressed as a decimal fraction).
(R) = Annual mass of air pollution control residue collected (metric tons).
(C_R) = Carbon content of the air pollution control residue, from the carbon analysis results (percent by weight, expressed as a decimal fraction).

Table 2-2c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS

Potential Emissions of Regulated Air Pollutants from Coal Combustion in Submerged Arc Furnaces
(Hazardous Air Pollutants)***

Pollutant	HAP Yes/No	Emission Factor (lb/ton)	Emission Factor Source**	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (tons/yr)
Formaldehyde	Yes	2.40E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	3.30E-03	1.26E-02
Acenaphthene	Yes	5.10E-07	AP-42 Coal Combustion (9/98) Table 1.1-13	7.01E-06	2.68E-05
Acenaphthylene	Yes	2.50E-07	AP-42 Coal Combustion (9/98) Table 1.1-13	3.44E-06	1.31E-05
Acetaldehyde	Yes	5.70E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	7.84E-03	3.00E-02
Acetophenone	Yes	1.50E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	2.06E-04	7.88E-04
Acrolein	Yes	2.90E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	3.99E-03	1.52E-02
Antimony	Yes	1.80E-05	AP-42 Coal Combustion (9/98) Table 1.1-18	2.48E-04	9.46E-04
Anthracene	Yes	2.10E-07	AP-42 Coal Combustion (9/98) Table 1.1-13	2.89E-06	1.10E-05
Arsenic	Yes	4.10E-04	AP-42 Coal Combustion (9/98) Table 1.1-18	5.64E-03	2.15E-02
Benz(a)anthracene	Yes	8.00E-08	AP-42 Coal Combustion (9/98) Table 1.1-13	1.10E-06	4.20E-06
Benz(a)pyrene	Yes	3.80E-08	AP-42 Coal Combustion (9/98) Table 1.1-13	5.23E-07	2.00E-06
Benzene	Yes	1.30E-03	AP-42 Coal Combustion (9/98) Table 1.1-14	1.79E-02	6.83E-02
Benzo(b,j,k)fluoranthene	Yes	1.10E-07	AP-42 Coal Combustion (9/98) Table 1.1-13	1.51E-06	5.78E-06
Benzo(g,h,i)perylene	Yes	2.70E-08	AP-42 Coal Combustion (9/98) Table 1.1-13	3.71E-07	1.42E-06
Benzyl chloride	Yes	7.00E-04	AP-42 Coal Combustion (9/98) Table 1.1-18	9.63E-03	3.68E-02
Beryllium	Yes	2.10E-05	AP-42 Coal Combustion (9/98) Table 1.1-18	2.89E-04	1.10E-03
Biphenyl	Yes	1.70E-06	AP-42 Coal Combustion (9/98) Table 1.1-13	2.34E-05	8.94E-05
Bis(2-ethylhexyl)phthalate (DEHP)	Yes	7.30E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	1.00E-02	3.84E-02
Bromoform	Yes	3.90E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	5.36E-04	2.05E-03
Cadmium	Yes	5.10E-05	AP-42 Coal Combustion (9/98) Table 1.1-18	7.01E-04	2.68E-03
Carbon disulfide	Yes	1.30E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	1.79E-03	6.83E-03
2-Chloroacetophenone	Yes	7.00E-06	AP-42 Coal Combustion (9/98) Table 1.1-14	9.63E-05	3.68E-04
Chlorobenzene	Yes	2.20E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	3.03E-04	1.16E-03
Chloroform	Yes	5.90E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	8.11E-04	3.10E-03
Chromium	Yes	2.60E-04	AP-42 Coal Combustion (9/98) Table 1.1-18	3.58E-03	1.37E-02
Chrysene	Yes	1.00E-07	AP-42 Coal Combustion (9/98) Table 1.1-13	1.38E-06	5.26E-06
Cobalt	Yes	1.00E-04	AP-42 Coal Combustion (9/98) Table 1.1-18	1.38E-03	5.26E-03
Cumene	Yes	5.30E-06	AP-42 Coal Combustion (9/98) Table 1.1-14	7.29E-05	2.79E-04
Cyanide	**Yes**	**2.50E-03**	**AP-42 Coal Combustion (9/98) Table 1.1-14**	**3.44E-02**	**1.31E-01**
Dimethyl sulfate	Yes	4.80E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	6.60E-04	2.52E-03
2,4-Dinitrotoluene	Yes	2.80E-07	AP-42 Coal Combustion (9/98) Table 1.1-14	3.85E-06	1.47E-05
Ethyl Benzene	Yes	9.40E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	1.29E-03	4.94E-03
Ethyl chloride	Yes	4.20E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	5.78E-04	2.21E-03
Ethylene dichloride	Yes	4.00E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	5.50E-04	2.10E-03
Ethylene Dibromide	Yes	1.20E-06	AP-42 Coal Combustion (9/98) Table 1.1-14	1.65E-05	6.31E-05
Fluoranthene	Yes	7.10E-07	AP-42 Coal Combustion (9/98) Table 1.1-13	9.76E-06	3.73E-05
Fluorene	Yes	9.10E-07	AP-42 Coal Combustion (9/98) Table 1.1-13	1.25E-05	4.78E-05
Hexane	Yes	6.70E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	9.21E-04	3.52E-03
Indeno(1,2,3-cd)pyrene	Yes	6.10E-08	AP-42 Coal Combustion (9/98) Table 1.1-13	8.39E-07	3.21E-06
Isophorone	yes	5.80E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	7.98E-03	3.05E-02
Lead	Yes	4.20E-04	AP-42 Coal Combustion (9/98) Table 1.1-18	5.78E-03	2.21E-02
Manganese	Yes	4.90E-04	AP-42 Coal Combustion (9/98) Table 1.1-18	6.74E-03	2.58E-02
Mercury	Yes	8.30E-05	AP-42 Coal Combustion (9/98) Table 1.1-18	1.14E-03	4.36E-03
Methyl Bromide	Yes	1.60E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	2.20E-03	8.41E-03
Methyl Chloride	Yes	5.30E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	7.29E-03	2.79E-02
Methyl Ethyl Ketone	Yes	3.90E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	5.36E-03	2.05E-02
Methyl Hydrazine	Yes	1.70E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	2.34E-03	8.94E-03
Methyl methacrylate	Yes	2.00E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	2.75E-04	1.05E-03
Methyl tert-butyl Ether	Yes	3.50E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	4.81E-04	1.84E-03
Methylene Chloride	Yes	2.90E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	3.99E-03	1.52E-02
Naphthalene	Yes	1.30E-05	AP-42 Coal Combustion (9/98) Table 1.1-13	1.79E-04	6.83E-04
Nickel	Yes	2.80E-04	AP-42 Coal Combustion (9/98) Table 1.1-18	3.85E-03	1.47E-02
Phenanathrene	Yes	2.70E-06	AP-42 Coal Combustion (9/98) Table 1.1-13	3.71E-05	1.42E-04
Phenol	Yes	1.60E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	2.20E-04	8.41E-04
Propionaldehyde	Yes	3.80E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	5.23E-03	2.00E-02
Pyrene	Yes	3.30E-07	AP-42 Coal Combustion (9/98) Table 1.1-13	4.54E-06	1.73E-05
Selenium	Yes	1.30E-03	AP-42 Coal Combustion (9/98) Table 1.1-18	1.79E-02	6.83E-02
Tetrachloroethylene	Yes	4.30E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	5.91E-04	2.26E-03
Toluene	Yes	2.40E-04	AP-42 Coal Combustion (9/98) Table 1.1-14	3.30E-03	1.26E-02
1,1,1-Trichloroethane	Yes	2.00E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	2.75E-04	1.05E-03
Styrene	Yes	2.50E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	3.44E-04	1.31E-03
Xylenes	Yes	3.70E-05	AP-42 Coal Combustion (9/98) Table 1.1-14	5.09E-04	1.94E-03
Vinyl acetate	Yes	7.60E-06	AP-42 Coal Combustion (9/98) Table 1.1-14	1.05E-04	3.99E-04
				Total (TPY)=	**0.70**

Workscope	Total Coal Throughput (tons/hour)	Total Coal Throughput (tons/year)
Four (4) Submerged Arc Furnaces	13.75	105,120

Notes:

*Regulated under Section 112(b) for Clean Air Act

**Emission factors taken from AP-42, Chapter 1 - Coal Combustion (9/98) Table 1.1-13 "Emission Factors for Polynuclear Aromatic Hydrocarbons (PAH) from Controlled Coal Combustion", Table 1.1-14 "Emission Factors for Various Organic Compounds from Controlled Coal Combustion" and Table 1.1-18 "Emission Factors for Trace Metals from Controlled Coal Combustion"

***No data exists on potential HAP emissions involving submerged arc furnaces associated with the ferroalloy industrial sector. Since coal is being utilized, these factors were used to define the potential level of regulated HAPs from a submerged arc furnace.

[ ] = Individual HAP with the highest emission rate

Example Calculations
Estimated Uncontrolled Emissions (lbs/hr) = Emission Factor (lbs/ton) * Total Coal Throughput (tons/hr)
Estimated Uncontrolled Emissions (tons/yr) = Emission Factor (lbs/ton) * Total Coal Throughput (tons/yr) / 2000

Table 2-2d
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS

Potential Emissions of Regulated Air Pollutants from Wood Combustion in Submerged Arc Furnaces
(Hazardous Air Pollutants)***

Pollutant	HAP* Yes/No	Emission Factor (lb/MMBtu)	Emission Factor Source	Potential Emissions (Controlled/Uncontrolled) (lbs/hr)	Potential Emissions (Controlled/Uncontrolled) (tons/yr)
Acenaphthene	Yes	9.10E-07	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.63E-04	1.01E-03
Acenaphthylene	Yes	5.00E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.45E-03	5.53E-03
Acetaldehyde	Yes	8.30E-04	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.40E-01	9.18E-01
Acetophenone	Yes	3.20E-09	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	9.26E-07	3.54E-06
Acrolein	Yes	9.78E-06	Vacated Boiler MACT backup database tests on wood-burning fluidized bed boilers	2.83E-03	1.08E-02
Antimony	Yes	7.90E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	2.29E-03	8.74E-03
Anthracene	Yes	3.00E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	8.68E-04	3.32E-03
Arsenic	Yes	2.20E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	6.37E-03	2.43E-02
Benzene	Yes	1.11E-05	Vacated Boiler MACT backup database tests on wood-burning fluidized bed boilers	3.21E-03	1.23E-02
Benzo(a)anthracene	Yes	6.50E-08	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.88E-05	7.19E-05
Benzo(a)pyrene	Yes	2.60E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	7.53E-04	2.88E-03
Benzo(b)fluoranthene	Yes	1.00E-07	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.89E-05	1.11E-04
Benzo(e)pyrene	Yes	2.60E-09	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	7.53E-07	2.88E-06
Benzo(g,h,i)perylene	Yes	9.30E-08	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.69E-05	1.03E-04
Benzo(j,k)fluoranthene	Yes	1.60E-07	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	4.63E-05	1.77E-04
Benzo(k)fluoranthene	Yes	3.60E-08	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.04E-05	3.98E-05
Beryllium	Yes	1.10E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	3.18E-04	1.22E-03
bis(2-Ethylhexyl)phthalate	Yes	4.70E-08	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.36E-05	5.20E-05
Bromomethane	Yes	1.50E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	4.34E-03	1.66E-02
2-Butanone (MEK)	Yes	5.40E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.56E-03	5.97E-03
Cadmium	Yes	4.10E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	1.19E-03	4.54E-03
Carbon tetrachloride	Yes	4.50E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.30E-02	4.98E-02
Chlorine	Yes	7.90E-04	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.29E-01	8.74E-01
Chlorobenzene	Yes	3.30E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	9.55E-03	3.65E-02
Chloroform	Yes	2.80E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	8.10E-03	3.10E-02
Chloromethane	Yes	2.30E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	6.66E-03	2.54E-02
Chromium	Yes	2.10E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	6.08E-03	2.32E-02
Chrysene	Yes	3.80E-08	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.10E-05	4.20E-05
Cobalt	Yes	6.50E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	1.88E-03	7.19E-03
Decachlorobiphenyl	Yes	2.70E-10	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	7.81E-08	2.99E-07
Dibenzo(a,h)anthracene	Yes	9.10E-09	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.63E-06	1.01E-05
Dichloromethane	Yes	2.90E-04	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	8.39E-02	3.21E-01
2,4-Dinitrophenol	Yes	1.80E-07	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	5.21E-05	1.99E-04
Ethylbenzene	Yes	3.10E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	8.97E-03	3.43E-02
Fluoranthene	yes	1.60E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	4.63E-04	1.77E-03
Fluorene	Yes	3.40E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	9.84E-04	3.76E-03
Formaldehyde	Yes	1.77E-04	Vacated Boiler MACT backup database tests on wood-burning fluidized bed boilers	5.12E-02	1.96E-01
Hydrogen chloride	**Yes**	**8.70E-03**	**Engineering Estimates**	**2.52E+00**	**9.63E+00**
Indeno(1,2,3,c,d)pyrene	Yes	8.70E-08	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.52E-05	9.63E-05
Lead	Yes	4.80E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	1.39E-02	5.31E-02
Manganese	Yes	2.48E-04	Vacated Boiler MACT backup database tests on wood-burning fluidized bed boilers	7.18E-02	2.74E-01
Mercury	Yes	3.50E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	1.01E-03	3.87E-03
Naphthalene	Yes	9.70E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.81E-02	1.07E-01
Nickel	Yes	3.30E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	9.55E-03	3.65E-02
4-Nitrophenol	Yes	1.10E-07	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	3.18E-05	1.22E-04
Phenanthrene	Yes	7.00E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	2.03E-03	7.74E-03
Phenol	Yes	5.10E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.48E-02	5.64E-02
Propionaldehyde	Yes	6.10E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	1.77E-02	6.75E-02
Selelum	Yes	2.80E-06	AP-42 Wood Residue Combustion (9/03) Table 1.6-4	8.10E-04	3.10E-03
Styrene	Yes	5.60E-07	Vacated Boiler MACT backup database tests on wood-burning fluidized bed boilers	1.62E-04	6.20E-04
Toluene	Yes	4.60E-06	Vacated Boiler MACT backup database tests on wood-burning fluidized bed boilers	1.33E-03	5.09E-03
2,4,6-Trichlorophenol	Yes	2.20E-08	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	6.37E-06	2.43E-05
Vinyl Chloride	Yes	1.80E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	5.21E-03	1.99E-02
Xylene	Yes	2.50E-05	AP-42 Wood Residue Combustion (9/03) Table 1.6-3	7.24E-03	2.77E-02
				Total (TPY)=	**12.91**

Equipment	Total Wood Throughput (lbs/hr)	Total Wood Throughput (lbs/yr)
Four (4) Submerged Arc Furnaces	27.83	212,763
Heating Value of Wood - 5200 BTU/lb	55,660 lb/hr	425,525,760 lb/hr

289	MMBtu/hr
2,212,734	MMBtu/yr

Notes:

*Regulated under Section 112(b) for Clean Air Act

**Emission factors taken from AP-42, Chapter 1 - Wood Residue Combustion (9/03) Table 1.6-3 "Emission Factors for Speciated Organic Compounds, TOC, VOC, Nitrous Oxide, and Carbon Dioxide from Wood Residue Combustion"

***No data exists on potential HAP emissions involving submerged arc furnaces associated with the ferroalloy industrial sector. Since coal is being utilized, these factors were used to define the potential level of regulated HAPs from a submerged arc furnace.

[ ] = Individual HAP with the highest emission rate

Example Calculations

Estimated Uncontrolled Emissions (lbs/hr) = Emission Factor (lbs/MMBtu) * Heat Input Rate (MMBtu/hr)
Estimated Uncontrolled Emissions (tons/yr) = Emission Factor (lbs/MMBtu) * Heat Input Rate (MMBtu/yr) /2000

Table 2-2e
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Regulated Air Pollutant Emissions from the Casting Frames (Criteria Air Pollutants)

Equipment Description	Emission Point ID	Maximum Hours per Year	Maximum Throughput-out (tons/hour)	Maximum Throughput-out (tons/year)	Estimated Emissions - $PM/PM_{10}/PM_{2.5}$	
					lbs/hr	tons/yr
Casting Frame #1	AA-201a	8760	2.75	21,024	0.003	0.013
Casting Frame #2	AA-201a		2.75	21,024	0.003	0.013
Casting Frame #3	AA-201a		2.75	21,024	0.003	0.013
Casting Frame #4	AA-201a		2.75	21,024	0.003	0.013
				Total	0.014	0.05

Example Calculations
Estimated Emissions (lbs/hr) = Maximum Throughput (tons/hr) * Emission Factor (lb/ton) * (1 - Adjustment Factor)
Estimated Emissions (tons/yr) = Maximum Throughput (tons/yr) * Emission Factor (lb/ton) / 2000 * (1 - Adjustment Factor)

Emission / Process	Emission Factors[b]	
	PM_{10} (kg/ton)	PM_{10} (lb/ton)
Casting - Hot Metal Transfer Uncontrolled	0.028	0.062

Adjustment Factor[c]
98%

Note:
(a) Reflects maximum amount of liquid silicon to pass through this operation and assumes four casting frames. Primary source of PM is estimated at the initial point of liquid silicon loading f the ladles to the casting frames.
(b) Emission factor based on National Pollutant Inventory - Emission Estimation Technique Manual for Iron and Steel Production. First published in September 1999. (Environment Australia Table 10 - Emission Factors for Steel Teeming and Casting Operations.
(c) Adjustment factor to account for this being an indoor emission source. Potential emissions of PM/PM10/PM2.5 are anticipated to be minimal, however this estimation method was utili account for these potential emissions

Table 2-3a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Natural Gas Combustion (Manufacturing - Ladle Pre-Heaters)
(Criteria Air Pollutants)

Combustion Equipment - Natural Gas

Emission Point ID	Description	Heat Input (MMBTU/hr)	Heat Input (MMBtu/year)	Air Emissions Summary							
				$PM/PM_{10}/PM_{2.5}$		SO_2		NO_x		VOC	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
AA-202	Ladle Pre-Heaters - 2 Ton Ladle Capacity 4 Units - 10 MMBtu/hr (Each)	40	350,400	0.020	0.089	0.0235	0.1031	3.20	14.02	0.2157	0.94
			Totals	0.02	0.09	0.024	0.10	3.20	14.02	0.22	0.94

Maximum Hours per Year - Natural Gas = 8,760 hours/year

Natural Gas Combustion Emission Factors

CATEGORY	EMISSION FACTORS (lbs/MMcf)						Emission Factors** (lbs/MMBtu)				
	$PM/PM_{10}/PM_{2.5}$	SO_2	NOx	VOC	CO	Pb	$PM/PM_{10}/PM_{2.5}$	SO_2	NO_x	VOC	CO
Natural Gas < 100 MMBtu	0.52	0.6	82	5.5	84.0	0.0005	0.0005	0.0005882	0.08	0.0054	0.082

Note:
*Emission factors from AP-42, Chapter 1 - External Combustion Sources.
*Factors for NO_x and CO taken from Table 1.4-1 - Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion. Small Boilers (< 100) - Uncontrolled.
*Factors for VOC, SO_2 and Pb taken from Table 1.4-2 - Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion. Emission factor of 0.52 lb/MMscf (0.0005 lbs/MMBtu) for $PM/PM_{10}/PM_{2.5}$ is based on EPA's $PM_{2.5}$ natural gas combustion study (2010). All PM (total, condensable, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors may be used to estimate PM_{10} and $PM_{2.5}$.
**To convert lbs/MMcf to lbs/MMBtu, the lbs/MMcf emission factors were divided by 1,020.

Example Calculations
Estimated Uncontrolled Emissions (lbs/hr) = Heat Input Rate (lbs/MMBtu) * Emission Factor (lbs/MMBtu)
Estimated Uncontrolled Emissions (tons/yr) = Estimated Uncontrolled Emissions (lbs/hr) * Hours of Operation (hrs/yr) / 2000

Table 2-3b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Natural Gas Combustion (Manufacturing - Ladle Pre-Heaters)
(Hazardous Air Pollutants)

Pollutant	HAP* Yes/No	Emission Factor (lb/MMBtu)**	Emission Factor Source	Estimated Potential Uncontrolled Emissions (lb/hr)
Formaldehyde	Yes	7.35E-05	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**2.94E-03**
2-Methylnaphthalene	Yes	2.35E-08	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**9.41E-07**
3-Methylchloranthrene	Yes	1.76E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**7.06E-08**
7,12-Dimethylbenz(a)anthracene	Yes	1.57E-08	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**6.27E-07**
Acenaphthene	Yes	1.76E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**7.06E-08**
Acenaphthylene	Yes	1.76E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**7.06E-08**
Anthracene	Yes	2.35E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**9.41E-08**
Arsenic	Yes	1.96E-07	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**7.84E-06**
Benz(a)anthracene	Yes	1.76E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**7.06E-08**
Benz(a)pyrene	Yes	1.18E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**4.71E-08**
Benzene	Yes	2.06E-06	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**8.24E-05**
Benzo(b)fluoranthene	Yes	1.76E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**7.06E-08**
Benzo(g,h,i)perylene	Yes	1.18E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**4.71E-08**
Benzo(k)fluoranthene	Yes	1.76E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**7.06E-08**
Beryllium	Yes	1.18E-08	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**4.71E-07**
Cadmium	Yes	1.08E-06	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**4.31E-05**
Chromium	Yes	1.37E-06	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**5.49E-05**
Chrysene	Yes	1.76E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**7.06E-08**
Cobalt	Yes	8.24E-08	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**3.29E-06**
Dibenzo(a,h)anthracene	Yes	1.18E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**4.71E-08**
Dichlorobenzene	Yes	1.18E-06	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**4.71E-05**
Fluoranthene	Yes	2.94E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**1.18E-07**
Fluorene	Yes	2.75E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**1.10E-07**
Hexane	**Yes**	**1.76E-03**	**AP-42 Nat. Gas Comb. (7/98), Table 1.4-3**	**7.06E-02**
Indeno(1,2,3-cd)pyrene	Yes	1.76E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**7.06E-08**
Manganese	Yes	3.73E-07	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**1.49E-05**
Mercury	Yes	2.55E-07	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**1.02E-05**
Naphthalene	Yes	5.98E-07	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**2.39E-05**
Nickel	Yes	2.06E-06	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**8.24E-05**
Phenanathrene	Yes	1.67E-08	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**6.67E-07**
Pyrene	Yes	4.90E-09	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**1.96E-07**
Selenium	Yes	2.35E-08	AP-42 Nat. Gas Comb. (7/98), Table 1.4-4	**9.41E-07**
Toluene	Yes	3.33E-06	AP-42 Nat. Gas Comb. (7/98), Table 1.4-3	**1.33E-04**

Total (TPY)=

Equipment	Total Heat Input (MMBtu/hr)	Hours of Operation (hrs/yr)
Natural Gas-Fired Combustion Sources - Silicon Manufacturing Plant - Ladle Pre-Heaters (AA-202)	40.00	8760

Notes:
*Regulated under Section 112(b) for Clean Air Act
**Emission factors taken from AP-42, Chapter 1 - External Combustion Sources, Table 1.4-3 - Emission Factors for Speciated Organic Compounds from Natural Gas Combustion and Table 1.4-4 - Emission Factors for Metals from Natural Gas Combustion
[ ] = Individual HAP with the highest emission rate

Example Calculations
Estimated Uncontrolled Emissions (lbs/hr) = Emission Factor (lbs/MMBtu) * Heat Input Rate (MMBtu/hr)
Estimated Uncontrolled Emissions (tons/yr) = Estimated Uncontrolled Emissions (lbs/hr) * Hours of Operation / 2000

Table 2-3c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Natural Gas Combustion - Silicon Purification Process (Greenhouse Gases)

Emission Factor Table

Fuel	Fuel Classification	Higher Heating Value (HHV)				CO_2 Emission Factor (EF)				CH_4 Emission Factor (EF)			
		Value - HHV	Custom - HHV	Default - HHV	Units	Value - EF	Custom - EF	Default - EF	Units	Value - EF	Custom - EF	Default - EF	Unit
Natural Gas	Fossil-gaseous	0.001028		1.028E-03	MMBtu/scf	53.02		53.02	kg/MMBtu	0.001		1.0E-03	kg/MM

Notes:

a) Default values for natural gas were obtained from the EPA Greenhouse Gas Reporting Rule (10/30/2009) Tables C-1 and C-2. Table C-1 - Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel. Table C-2 - Default CH_4 and N_2O Emission Factors for Various Types of Fuel.

b) Please convert any custom values to the specified default units.

Color Key:

Optional Data (Provide if Available). Default emission factors are used unless operational data/factors are provided.

Annual GHG Calculation (By GHG Rule Eq. C-2a and C-2b)

Fuel Use (MMBtu/hr)	Fuel Use (MMBtu/yr)	Fuel Use (scf/yr)	Calculation Tier[a]
40.00	350,400	340,856,031	Tier 1

Parameter	CO_2	CH_4	N_2O	TOTAL
EF[b] (kg/MMBtu)	53.02	0.001	0.0001	--
Estimated GHG Emissions (metric tons)	18,578	0.350	0.0350	--
Estimated GHG Emissions (tons)	**20,479**	**0.386**	**0.0386**	**--**
Global Warming Potential (GWP)[c] (kg CO_2e/kg)	1	21	310	--
Estimated GHG Emissions (metric tons CO_2e)	18,578	7.36	10.86	18,596
Estimated GHG Emissions (tons CO_2e)	**20,479**	**8.11**	**11.97**	**20,499**

Notes:

a) The default HHV value from Table C-1 of the EPA Greenhouse Gas Reporting Rule is substituted when no actual HHV data from fuel sampling is available. Use of the default HHV value constitutes the Tier 1 calculation method while use of HHV values obtained from fuel sampling constitutes Tier 2.

b) Emission factors (EF) for natural gas were obtained from Tables C-1 and C-2 of the EPA Greenhouse Gas Reporting Rule (40 CFR 98). Table C-1 - Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel. Table C-2 - Default CH_4 and N_2O Emission Factors for Various Types of Fuel.

c) Global warming potentials (GWP) were obtained from Table A-1 of the EPA Greenhouse Gas Reporting Rule (40 CFR 98).

Example Calculations

Estimated GHG Emissions (metric tons) = Fuel Use (MMBtu/yr) * Emission Factor (kg/MMBtu) * High Heat Value (MMBtu/scf) * 0.001

Estimated GHG Emissions (metric tons CO_2e) = Estimated GHG Emissions (metric tons) * Global Warming Potential (kg CO_2e/kg)

Estimated GHG Emissions (tons CO_2e) = Estimated GHG Emissions (metric tons CO_2e) * 1.10231

Table 2-4
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Raw Material Receiving, Handling, and Storage (Criteria Air Pollutants)

Raw Material Emission Source Operation	Material Throughput, T	Mean Wind Speed, U		Moisture Content, M		Air Pollutant Emission Factor, EF			Uncontrolled Annual Air Pollutant Emissions, Q_u (tons/year)			Control Efficiency, C	Controlled Annual Air Pollutant Emissions, Q_c (tons/year)			Maximum Air P (lbs	
	(tons/year)	(mph)		(%)		PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$	[illegible]	PM	PM_{10}	$PM_{2.5}$	PM	P
[illegible]																	
[illegible]																	
Truck Receiving to Storage Pile (Drop Point)	105,120	6.8	(a)	1.8	(b)	1.0E-03	4.9E-04	7.4E-05	0.05	0.03	0.004	90.0%	0.01	0.003	0.0004	0.0012	0.0
Front End Loader from Storage Pile to Receiving Building (Transfer Point)	105,120	6.8	(a)	1.8	(b)	1.0E-03	4.9E-04	7.4E-05	0.05	0.03	0.004	90.0%	0.01	0.003	0.0004	1.24E-03	5.8
Receiving Building Hopper to Conveyor (Transfer Point)	105,120	6.8	(a)	1.8	(b)	1.0E-03	4.9E-04	7.4E-05	0.05	0.03	0.004	90.0%	0.01	0.003	0.0004	1.24E-03	5.8
Conveyor to Charging Storage Silo (Transfer Point)* (AA-101a)	105,120	6.8	(a)	1.8	(b)	1.0E-03	4.9E-04	7.4E-05	0.05	0.03	0.004	90.0%	*Emissions will be controlled by a baghouse. Refe estimated emissions				
Charging Storage Silo to EAF (Transfer Point)	105,120	6.8	(a)	1.8	(b)	1.0E-03	4.9E-04	7.4E-05	0.05	0.03	0.004	90.0%	0.01	0.003	0.0004	1.24E-03	5.8
Total Material Transfer to and from Coal Storage Pile (AA-101)	--	--	--	--	--	--	--	--	**0.27**	**0.13**	**0.020**	--	**0.02**	**0.01**	**0.002**	--	
[illegible]																	
Truck Unloaded to Log Storage Pile (Drop Point)	212,763	6.8	(a)	55.0	(d)	6.4E-05	3.0E-05	4.6E-06	0.007	0.003	0.0005	90.0%	0.001	0.0003	0.00005	1.56E-04	7.3
Front End Loader from Log Storage Pile to Wood Chipper (Transfer Point)	212,763	6.8	(a)	55.0	(d)	6.4E-05	3.0E-05	4.6E-06	0.007	0.003	0.0005	90.0%	0.001	0.0003	0.00005	1.56E-04	7.3
Wood Chipper to Conveyor (Transfer Point)	212,763	6.8	(a)	55.0	(d)	6.4E-05	3.0E-05	4.6E-06	0.007	0.003	0.0005	90.0%	0.001	0.0003	0.00005	1.56E-04	7.3
Conveyor to Wood Chip Storage Pile (Drop Point)	212,763	6.8	(a)	55.0	(d)	6.4E-05	3.0E-05	4.6E-06	0.007	0.003	0.0005	90.0%	0.001	0.0003	0.00005	1.56E-04	7.3
Front End Loader from Storage Pile to Receiving Building (Transfer Point)	212,763	6.8	(a)	55.0	(d)	6.4E-05	3.0E-05	4.6E-06	0.007	0.003	0.0005	90.0%	0.001	0.0003	0.00005	1.56E-04	7.3
Receiving Building Hopper to Conveyor (Transfer Point)	212,763	6.8	(a)	55.0	(d)	6.4E-05	3.0E-05	4.6E-06	0.007	0.003	0.0005	90.0%	0.001	0.0003	0.00005	1.56E-04	7.3
Conveyor to Charging Storage Silo (Transfer Point)* (AA-102a)	212,763	6.8	(a)	55.0	(d)	6.4E-05	3.0E-05	4.6E-06	0.007	0.003	0.0005	90.0%	*Emissions will be controlled by a baghouse. Refe estimated emissions				
Charging Storage Silo to EAF (Transfer Point)	212,763	6.8	(a)	55.0	(d)	6.4E-05	3.0E-05	4.6E-06	0.007	0.003	0.0005	90.0%	0.001	0.0003	0.00005	1.56E-04	7.3
Total Material Transfer to and from Wood Storage Pile (AA-102)	--	--	--	--	--	--	--	--	**0.05**	**0.026**	**0.004**	--	**0.005**	**0.002**	**0.0003**	--	
[illegible]																	
Truck Receiving to Storage Pile (Drop Point)	212,763	6.8	(a)	[illegible]	(d)	8.9E-02	4.2E-02	6.4E-03	9.44	4.46	0.68	90.0%	0.94	0.45	0.07	0.22	0
Front End Loader from Storage Pile to Receiving Building (Transfer Point)	212,763	6.8	(a)	[illegible]	(d)	8.9E-02	4.2E-02	6.4E-03	9.44	4.46	0.68	90.0%	0.94	0.45	0.07	0.22	0
Receiving Building Hopper to Conveyor (Transfer Point)	212,763	6.8	(a)	[illegible]	(d)	8.9E-02	4.2E-02	6.4E-03	9.44	4.46	0.68	90.0%	0.94	0.45	0.07	0.22	0
Conveyor to Charging Storage Silo (Transfer Point)* (AA-103a)	212,763	6.8	(a)	[illegible]	(d)	8.9E-02	4.2E-02	6.4E-03	9.44	4.46	0.68	90.0%	*Emissions will be controlled by a baghouse. Refe estimated emissions				
Charging Storage Silo to EAF (Transfer Point)	212,763	6.8	(a)	[illegible]	(d)	8.9E-02	4.2E-02	6.4E-03	9.44	4.46	0.68	90.0%	0.94	0.45	0.07	0.22	0
Total Material Transfer to and fromQuartz Storage Pile (AA-103)	--	--	--	--	--	--	--	--	**47.2**	**22.3**	**3.4**	--	**3.5**	**1.6**	**0.27**	--	
[illegible]																	
Truck to Receiving Building (Drop Point)	183	6.8	(a)	[illegible]	(d)	8.9E-02	4.2E-02	6.4E-03	0.01	0.004	0.001	90.0%	0.0008	0.0004	0.0001	0.0002	0.0
Receiving Building to EAF (Transfer Point)	183	6.8	(a)	[illegible]	(d)	8.9E-02	4.2E-02	6.4E-03	0.01	0.004	0.001	90.0%	0.0008	0.0004	0.0001	0.0002	0.0
Total Limestone Material Handling (AA-104)	--	--	--	--	--	--	--	--	**0.02**	**0.008**	**0.001**	--	**0.0016**	**0.0008**	**0.0001**	--	
TOTAL [illegible]	--	--		--		--	--	--	**47.56**	**22.46**	**3.46**	--	**3.56**	**1.69**	**0.27**	--	

Average Daily Wind Speed (mph): 6.8

[illegible]		
PM	PM_{10}	$PM_{2.5}$
0.74	0.35	0.053

Calculation Method:

Emission factor, EF ([lb]/ton) = k * (0.0032) * $(U/5)^{1.3}$ / $(M/2)^{1.4}$
where:
k = Particle Size Multiplier
U = Mean Wind Speed (mph (miles per hour))
M = Moisture Content of Material (%)
Calculation Method Obtained From AP-42 Chapter 13.2.4 Equation 1
Particle Size Multipliers Obtained From AP-42 Chapter 13.2.4

Uncontrolled Air Emissions, Q_u (tons/year) = T (tons/year) * EF ([lb]/ton) / (2000 lb/ton)

where:

Q_u = Uncontrolled Air Pollutant Emission Rate

T = Coal Throughput

Controlled Air Emissions, Qc (ton/year) = Qu (ton/year) * (1 - C)
where:
Q_c = Controlled Air Pollutant Emission Rate

Sample Calculations:

EF = 0.001 lb-emitted/ton-throughput = 0.74 * 0.0032 * (6.8/5)^1.3 / (4.8/2)^1.4
Q_u = 0.01 tons/year = 0.05 tons/year x (1 - 90%) (Rail Car Bottom Unloaded to Hopper)

Notes:
a) Wind speed data obtained from National Climatic Data Center (NCDC) average wind speed for Tupelo, Mississippi.
b) Moisture content of coal typically ranges from 2.8-20% (AP-42 Table 13.2.4-1).

c) Control efficiency of 90% used to conservatively estimate potential emissions due to covers and enclosures on conveyors.

d) Calculation method based on AP-42 Section 13.2.4 "Aggregate Handling and Storage Piles." The calculation method was utilized since it covers the following ranges of source conditions: silt content percent (0.44-19), moisture content percent (0.25-4.8) and wind speed (1.3-15 mph). Typical silt and moisture contents have been identified for the following: crushed limestone (1.3-1.9% silt, 0.3-1.1% moisture), coal (3.4-16% silt, 2.8-20% moisture), wood (35% moisture), charcoal (5.0-10.0% moisture). Charcoal moisture content taken from the Food and Agriculture Organization of the United Nations - "Simple Technologies for Charcoal Making".

e) PM/PM10/PM2.5 emission estimates increased by a factor of three (3) to account for future variations in the material handling operations.
f) Material feed silo represents the material day bins.

Table 2-4a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Raw Material Receiving, Handling, and Storage (Criteria Air Pollutants) - Baghouses

Controlled Type Releases

Emission Point ID	Raw Material Emission Source Description	Flow** (acfm)	Emission Factor*** (gr/scf)	Operating Time (hr/yr)	Controlled Emissions lb/hr	Controlled Emissions tpy
AA-101a, AA-102a, AA-103a, AA-403	Material Handling (Coal, Wood, Quartz and Slag) Baghouse (BG5)	120,000	0.0015	8,760	1.54	6.76
AA-301	Product Handling Area Baghouse (BG6)	60,000	0.0015	8,760	0.77	3.38
				Subtotal	2.31	10.14

Calculation Method:
Controlled Emissions (lbs/hr) = Flow (acfm) * Emission Factor (gr/scf) * 60 min/hr * 1 lb/7000 gr
Controlled Emissions (tons/year) = Controlled Emissions (lbs/hr) * Operating Time (hr/yr) / 2000 lb/ton

Notes:
*Majority of potential $PM/PM_{10}/PM_{2.5}$ emissions will be captured and controlled by a baghouse. Uncontrolled emissions have been identified as a fugitive source.
**Number of baghouses may vary, however the total flow volume should reflect all discharge points to the baghouse(s) for Phase I and II.
***Emission factors for baghouse based on manufacturer's specifications.

Table 2-4b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Wood Chipper

1200 HP Electric Wood Chipper

Emission Point ID	Raw/Unfinished Emission Source Operation	Maximum Wood Throughput (tons/hr)	Emission Factor* (lb/ton chipped)			Controlled Emissions (lbs/hr)			Controlled Emissions (tons/year)		
			PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$
AA-102b	Wood Chipper	200	0.02	0.002	0.002	0.40	0.04	0.04	0.416	0.042	0.042

Hours of Operation

Maximum Hours of Operation/Year = 2080

Control Efficiency =** **90%**

Maximum Wood Throughput

Equipment Capacity (yd^3/hr) = 600

Density of Wood Chips (lb/yd^3) = 648

Maximum Wood Throughput (lb/hr) = 388,800

Maximum Wood Throughput (tons/hr) = 194.4

Example Calculations

Controlled Emissions (lbs/hr) = Maximum Wood Throughput (tons/hr) * Emission Factor (lb/ton chipped) * (1- control efficiency)

Controlled Emissions (tons/year) = Controlled Emissions (lbs/hr) * Operating Time (hr/yr) / 2000 lb/ton

Notes:

*PM emission factor based on Idaho Department of Environmental Quality factor for similar source (wood deparking) as referenced in Idaho air permit number 4051-00. Assumed that PM_{10} emissions are 10% of PM emissions based on North Carolina Department of Environment and Natural Resources study "Estimating Emissions from Generation and Combustion of "Waste" Wood DRAFT" (July 15, 1998), which indicated that PM_{10} generated during milling and sawing is at most 10% of PM. Assumed that $PM_{2.5}$ emissions are equal to PM_{10} emissions.

** Control efficiency of 90% based on enclosure of chipping area.

Table 2-4c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Slag Handling

Slag Screening and Transfer - AA-403

Material	Air Pollutant Emission Factor, EF (lb/T)* (lb-emitted/ton-throughput)			Uncontrolled Annual Air Pollutant Emissions, Q_u (tons/year)			Control Efficiency, C (%)**
	PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$	
Slag Crushing	5.4E-03	2.4E-03	2.4E-03	3.00E-02	1.33E-02	1.33E-02	99.0%
Slag Screening	2.5E-02	8.7E-03	8.7E-03	1.39E-01	4.84E-02	4.84E-02	99.0%
Conveyor Transfer Point	3.0E-03	1.1E-03	1.1E-03	1.67E-02	6.12E-03	6.12E-03	99.0%
Total	--	--	--	1.56E-01	5.45E-02	5.45E-02	--

Notes:

*AP-42 11.19.2-2 Emission Factors for Crushed Stone Processing Operations (Tertiary Crushing, Screening and Conveyor Transfer Point
**Slag Handled is based on four (4) Submerged Arc Furnaces and approximately 60 kg/hr (132 lbs/hr) of slag
***Slag will be processed as needed in the finished product processing area, this process incorporates a fabric filter baghouse.

Slag Handled (tons/year) =** **11,124**

Pounds per Ton = 2000

Example Calculations
Estimated Uncontrolled Emissions (tons/yr) = Emission Factor (lb-emitted/ton-throughput) * Slag (tons/year) / 2000
Estimated Controlled Emissions (tons/yr) = Uncontrolled Emissions (tons/year) * (1 - Control Efficiency)

Table 2-4d
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Silica Fume Silos

Silica Fume Silo - AA-404

Equipment	Maximum Air Flow (dscfm)	Emission Factor (gr/dscf)	$PM/PM_{10}/PM_{2.5}$ Emissions (lb/hr)	$PM/PM_{10}/PM_{2.5}$ Emissions (tons/year)
Silica Fume Silo #1 (12,000 ft^3)	100	0.01	0.009	0.038
Silica Fume Silo #2 (12,000 ft^3)	100	0.01	0.009	0.038
Silica Fume Silo #3 (12,000 ft^3)	100	0.01	0.009	0.038
Silica Fume Silo #4 (12,000 ft^3)	100	0.01	0.009	0.038
Total	–	–	**0.03**	**0.15**

Grains per Pound = 7,000
Hours per Year = 8,760
Minutes per Hour = 60

Example Calculations
Estimated Uncontrolled Emissions (lbs/hr) = Maximum Flow Rate (dscfm) * Emission Factor (gr/dscf) * 60 / 7000
Estimated Uncontrolled Emissions (tons/yr) = Estimated Uncontrolled Emissions (lbs/hr) x Hours of

PM/PM10/PM2.5 Emissions (lbs/hr) = 100 dscfm * 0.01 gr/dscfm * 60 / 7000 = 0.01 lbs/hr
PM/PM10/PM2.5 Emissions (tons/year) = 0.01 lbs/hr * 8,760 hours / 2000 lbs = 0.04 tons/year

Table 2-5
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants - Management of Outdoor Storage Areas (Criteria Air Pollutants)

Process	Material Silt Content[a], s (%)	Material Moisture Content[b], M (%)	Number of Dozers, n	Annual Operating Hours, t (hr)	Emission Factor, EF (lb/hr/dozer)			Control Efficiency[d] (%)	Controlled Emi	
					PM	PM_{10}	$PM_{2.5}$		PM	PM_{1}
Bulldozing on Coal Storage Areas (AA-105)	4.6	4.8	2	8760	63.68	15.31	1.40	99.0%	1.3	0.3
Bulldozing on Wood Storage Areas (AA-105)	2.0	35	2	8760	1.77	0.27	0.04	99.0%	0.04	0.0
Bulldozing on Quartz Storage Areas (AA-105)	0.1	0.2	2	8760	40.08	4.20	0.88	99.0%	0.8	0.1

Notes:

a) Material silt content for coal taken from Western Regional Air Partnership's (WRAP) Fugitive Dust Handbook. Silt content for quartz was not readily availble and was ass based on previous experience with emission calculations for wood storage piles.

b) Moisture content of coal and quartz (assumed to be the same as limestone) taken from Western Regional Air Partnership's (WRAP) Fugitive Dust Handbook. Moisture cc experience with emission calculations for wood storage piles.

c) Potential emissions of hazardous air pollutants assumed to be negligible.

d) Control efficiency of 99% assumed based on use of best management practices (i.e., dust minimization techniques including as needed water spray application and parti

Calculation Method:

EF_{PM} (lb/hr/dozer) = (78.4 * $(s)^{1.2}$) / ($(M)^{1.3}$) -- AP-42 Table 11.9-1 (Bulldozing - Coal and Overburden)

EF_{PM10} (lb/hr/dozer) = (0.75 * 18.6 * $(s)^{1.5}$) / ($(M)^{1.4}$) -- AP-42 Table 11.9-1 (Bulldozing - Coal and Overburden)

$EF_{PM2.5}$ (lb/hr/dozer) = (0.022 * 78.4 * $(s)^{1.2}$) / ($(M)^{1.3}$) -- AP-42 Table 11.9-1 (Bulldozing - Coal and Overburden)

Short-term PTE = EF * n

Long-term PTE = EF * n * t

Example Calculations:

PM10: EF = (0.75 * 18.6 * 4.6^1.5) / (4.8^1.4) = 15.31 lb-PM10/hr/dozer

PM10: Controlled Emissions (lbs/hr) = 15.31 lb-PM10/hr/dozer * 2 dozers = 0.31 lb/hr

PM10: Controlled Emissions (tons/yr) = 0.3 lb/hr * 8760 hours / (2000 lb/ton) = 1.34 tons/yr

Table 2-6
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants Due to Vehicle Traffic on Gravel Roads - In Plant Only (Criteria Air Pollutants)

Technical Support Information

Process Supported by Traffic on In-Plant Gravel Roads (AA-402)	Maximum Vehicle Weight, W (tons)	Number of Trips per Day	Number of Trips per Year	Miles/Trip	Annual VMT (miles)	Emission Factor, E (lb/VMT)			Controlle
						PM	PM_{10}	$PM_{2.5}$	PM
Trucks Loaded per Day (Wood) - Inbound	39	20	7,200	1.70	12,240	7.52	2.14	0.21	2.3
Trucks Loaded per Day (Wood) - Outbound	22	20	7,200	1.70	12,240	7.52	2.14	0.21	2.3
Trucks Loaded per Day (Coal) - Inbound	39	10	3,600	1.70	6,120	4.24	1.21	0.12	0.6
Trucks Loaded per Day (Coal) - Outbound	22	10	3,600	1.70	6,120	4.24	1.21	0.12	0.6
Trucks Loaded per Day (Quartz) - Inbound	39	20	7,200	1.70	12,240	7.52	2.14	0.21	2.3
Trucks Loaded per Day (Quartz) - Outbound	22	20	7,200	1.70	12,240	7.52	2.14	0.21	2.3
Trucks Loaded per Day (Limestone) - Inbound	39	1	24	1.70	41	7.52	2.14	0.21	0.0
Trucks Loaded per Day (Limestone) - Outbound	22	1	24	1.70	41	7.52	2.14	0.21	0.0
Trucks Loaded per Day (Finished Product) - Inbound	39	10	2,600	2.50	6,500	7.52	2.14	0.21	1.2
Trucks Loaded per Day (Finished Product) - Outbound	22	10	2,600	2.50	6,500	7.52	2.14	0.21	1.2
TOTALS	–	122	41,248	–	74,282	–	–	–	13.0

Notes:
(a) Emission estimate accounts for best management practices which are to be utilized to minimize the potential for fugitive dust emissions.

(b) Road dust emissions from the material handling equipment in the storage yard are expected to be inconsequential due to the low operating speed of the equipment.

(c) Potential emissions of hazardous air pollutants assumed to be negligible.

(d) Number of trips per day and number of trips per year based on Information Request dated May 29, 2013 (Rev. 1). Number of trips includes both Phase I and Phase II

Calculation Method:
Estimate vehicle miles traveled (VMT) annually
Annual VMT (miles) = Number of Trips per Day x 365 days/year x Miles/trip

Determine Emission Factor; AP-42, Section 13.2.2 - Unpaved Roads

$E = k*(s/12)^a * (W/3)^b * (N - P)/N$

Where:

E= Particulate Matter Emission Factor	varies	lb/VMT
s - Road Surface Silt Loading	8.4	% (Mean silt content from AP-42 Table 13.2.2-1 for "Haul road to/from pit")
W = Average Vehicle Weight (tons)	30	
P = Number of "wet" days during an averaging period	110	(AP-42 Figure 13.2.2-1)
N = number of days in averaging period	365	
VMT = vehicle miles traveled	varies by operation	

	PM	PM_{10}	$PM_{2.5}$
k = Particle Size Factor	4.9	1.5	0.15
a = constant	0.7	0.9	0.9
b = constant	0.45	0.45	0.45

Estimate Emissions,
PTE = Annual VMT * E * (100 - C)/100

C = Control efficiency 95 %

Table 2-6a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants Due to Vehicles Transporting Raw Materials (Criteria Air Pollutants)

Technical Support Information

Process Supported by Traffic on In-Plant Gravel Roads (AA-402a)	Emission Factor (lb/vehicle km traveled)[a]	Emission Factor (lb/vehicle mile travelled)	Miles/Trip	Miles/Year	Number of Trips (trips/hour)	Number of Trips (trips/day)	Number of Trips (trips/year)	Controlled Emissions (lb/hr)		
								PM	PM_{10}	$PM_{2.5}$
Vehicles Transferring Raw Materials from Material Storage Piles to SAF Charging Building	0.12	0.43	1.14	4993	1	12	4380	0.24	0.06	0.06
Vehicles Returning from SAF Charging Building to Material Storage Piles	0.12	0.43	1.14	4993	1	12	4380	0.24	0.06	0.06
TOTALS	-	-	-	-	-	-	-	0.5	0.1	0.1

C = Control efficiency 50.00 %

Particle size multplier: PM10/PM = 25%[a]

Notes:

(a) Emission factor based on National Pollutant Inventory - Emission Estimation Technique Manual for Iron and Steel Production. First published in September 1999. (Environment Australia). Table 11 - Emission Factors for Dust Generation Associated Light/Heavy Vehicle Mix)

(b) Assume one (1) trip takes one (1) hour and assume trips occur 365 days/year

(c) Controlled emission estimate based on futgitive dust control plant to minimize PM emissions including sweeping and watering as needed.

Example Calculation

Emissions (lbs/hr) = Emission Factor (lb/vehicle mile travelled) * Miles/Trip * Number of Trips (trips/hour)

Emissions (tons/year) = Emission Factor (lb/vehicle mile travelled) * Miles/Year / 2000

Table 2-7a
Mississippi Silicon, LLC.
Proposed Silicon Manufacturing Plant
Potential Emissions of Regulated Air Pollutants Due to Wind Erosion on Outdoor Coal Storage Areas - AA-106 (Criteria Air Pollutants)

Frequency of Disturbance (day/year)	365
Total Pile Surface Area, A (m^2)	9,135
Threshold Friction Velocity[a], u_t^* (m/s)	0.55
Anticipated Control Efficiency[b], C	50%

Particle Size Multiplier (k)		
PM	PM_{10}	$PM_{2.5}$
1	0.5	0.075

Erosion Potential During Each Disturbance

Disturbance Number[c], i	Fastest Mile Wind Speed for Disturbance[d], $u^+_{z,i}$ (m/s)	Reference Anemometer Height, z (m)	10-m Ref. Ht. Anemometer Fastest Mile, $u^+_{10,i}$ (m/s)	Friction Velocity, u^*_i (m/s)	Erosion Potential, P_i (g/m^2)	Uncontrolled Fugitive Emission Rate, R_i (tons/disturbance)		
						PM	PM_{10}	$PM_{2.5}$
162	10.7	10	10.73	0.57	0.49	0.005	0.002	0.0004

Total Annual Erosion Potential

Emission Scenario	Fugitive Emission Rate (tons/year)			Fugitive Emission Rate (lb/event)		
	PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$
Total Uncontrolled, R	9.87E+00	4.94E+00	7.40E-01	3.00E-02	1.50E-02	2.25E-03
Total Controlled, R_c	**4.94E+00**	**2.47E+00**	**3.70E-01**	**1.50E-02**	**7.50E-03**	**1.13E-03**

Notes:

a) Threshold friction velocity based on AP-42 Table 13.2.5-2 value for an "uncrusted coal pile".

b) Assumed control efficiency of 50% based on fugitive dust control plant including best management practices.

(c) Disturbances with Erosion Potential of zero (threshold friction velocity was not exceeded) are not shown in table.

d) Fastest mile wind speed data obtained from hourly National Climatic Data Center (NCDC) Quality Controlled Local Climatological Data (QCLCD) for Columbus, Mississippi for the year 2010. Hourly average wind speed was multiplied by a factor of 1.5 to estimate 5-second wind speed, according to the Durst curve for converting wind speeds.

Calculation Method & Sample Calculations (Based on AP-42 Chapter 13.2.5 - Industrial Wind Erosion):

$u^+_{10,i} = u^+_{z,i}\ (\ln(10/0.005) / \ln(z/0.005))$

$u^*_i = 0.0053\ u^+_{10,i}$

$P_i = 58\ (u^*_i - u_t^*)^2 + 25\ (u^*_i - u_t^*)$, for $u^*_i > u_t^*$

$P_i = 0$, for $u^*_i \le u_t^*$

$R_i = k\ P_i\ A$

$R = S^i\ R_i$

$R_c = R\ (1 - C)$

where:

$u^+_{10,i}$ = fastest mile wind speed for the i'th disturbance normalized to 10-m anemometer height

$u^+_{z,i}$ = fastest mile wind speed for the i'th disturbance measured at anemometer with height of z meters

u^*_i = friction velocity for the i'th disturbance

u_t^* = threshold friction velocity

P_i = erosion potential for the i'th disturbance

R_i = emission rate for the i'th disturbance

k = particle size multiplier

R = total uncontrolled annual emission rate

C = control efficiency (%)

R_c = controlled emission rate

R_i = 0 tons = 1 * 0 g/m2 * 9135 m2 / (453.59 g/lb) / (2000 lb/ton)

R = sum of all R_i

R_c = 4.94 tons/year = 9.87 tons/year x (1 - 50%)

Storage Pile Surface Area Calculation:

Assumed conical pile shape

Diameter, D (ft) = 250
Diameter, D (m) = 76.20
Height, H (ft) = 7
Height, H (m) = 2.13
Surface area, A (m^2) = 4,568
Number of Piles = 2
Total surface area, A (m^2) = 9,135

Table 2-7b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Potential Emissions of Regulated Air Pollutants Due to Wind Erosion on Outdoor Wood Storage Areas - AA-106 (Criteria Air Pollutants)

Frequency of Disturbance (days/year)	365
Total Pile Surface Area, A (m^2)	9,135
Threshold Friction Velocity[a], u_t^* (m/s)	1.12
Anticipated Control Efficiency[b], C	50%

Particle Size Multiplier (k)		
PM	PM_{10}	$PM_{2.5}$
1	0.5	0.075

Erosion Potential During Each Disturbance

Disturbance Number[c], i	Fastest Mile Wind Speed for Disturbance[d], $u^+_{z,i}$ (m/s)	Reference Anemometer Height, z (m)	10-m Ref. Ht. Anemometer Fastest Mile, $u^+_{10,i}$ (m/s)	Friction Velocity, u^*_i (m/s)	Erosion Potential, P_i (g/m²)	Uncontrolled Fugitive Emission Rate, R_i (tons/disturbance)		
						PM	PM_{10}	$PM_{2.5}$
550	18.8	10	18.78	1.00	0.000	0.00	0.00	0.00

Total Annual Erosion Potential

Emission Scenario	Fugitive Emission Rate (tons/year)			Fugitive Emission Rate (lb/event)		
	PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$
Total Uncontrolled, R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Controlled, R_c	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**

Notes:

a) Threshold friction velocity based on AP-42 Table 13.2.5-2 value for an "uncrusted coal pile".

b) Assumed control efficiency of 50% based on fugitive dust control plant including best management practices.

c) No disturbances exceeded an Erosion Potential of zero (threshold friction velocity was not exceeded). The disturbance with maximum wind speed is shown in table.

d) Fastest mile wind speed data obtained from hourly National Climatic Data Center (NCDC) Quality Controlled Local Climatological Data (QCLCD) for Columbus, Mississippi for the year 2010. Hourly average wind speed was multiplied by a factor of 1.5 to estimate 5-second wind speed, according to the Durst curve for converting wind speeds.

Calculation Method & Sample Calculations (Based on AP-42 Chapter 13.2.5 - Industrial Wind Erosion):

$u^+_{10,i} = u^+_{z,i}\,(\ln(10/0.005) / \ln(z/0.005))$

$u^*_i = 0.0053\, u^+_{10,i}$

$P_i = 58\,(u^*_i - u_t^*)^2 + 25\,(u^*_i - u_t^*)$, for $u^*_i > u_t^*$

$P_i = 0$, for $u^*_i \le u_t^*$

$R_i = k\, P_i\, A$

$R = S^i R_i$

$R_c = R\,(1 - C)$

R_i = 0 tons = 1 * 0 g/m2 * 9135 m2 / (453.59 g/lb) / (2000 lb/ton)

R = sum of all R_i

R_c = 0 tons/year = 0 tons/year x (1 - 50%)

where:

$u^+_{10,i}$ = fastest mile wind speed for the i'th disturbance normalized to 10-m anemometer height

$u^+_{z,i}$ = fastest mile wind speed for the i'th disturbance measured at anemometer with height of z meters

u^*_i = friction velocity for the i'th disturbance

u_t^* = threshold friction velocity

P_i = erosion potential for the i'th disturbance

R_i = emission rate for the i'th disturbance

k = particle size multiplier

R = total uncontrolled annual emission rate

C = control efficiency (%)

R_c = controlled emission rate

Storage Pile Surface Area Calculation:

Assumed conical pile shape

Diameter, D (ft) =	250
Diameter, D (m) =	76.20
Height, H (ft) =	7
Height, H (m) =	2.13
Surface area, A (m^2) =	4,568
Number of Piles =	2
Total surface area, A (m^2) =	9,135

Table 2-7c
Mississippi Silicon, LLC.
Proposed Silicon Manufacturing Plant
Potential Emissions of Regulated Air Pollutants Due to Wind Erosion on Outdoor Quartz Storage Areas - AA-106 (Criteria Air Pollutants)

Frequency of Disturbance (days/year)	365
Total Pile Surface Area, A (m^2)	9,135
Threshold Friction Velocity[a], u_t^* (m/s)	1.33
Anticipated Control Efficiency[b], C	50%

Particle Size Multiplier (k)		
PM	PM_{10}	$PM_{2.5}$
1	0.5	0.075

Erosion Potential During Each Disturbance

Disturbance Number[c], i	Fastest Mile Wind Speed for Disturbance[d], $u^+_{z,i}$ (m/s)	Reference Anemometer Height, z (m)	10-m Ref. Ht. Anemometer Fastest Mile, $u^+_{10,i}$ (m/s)	Friction Velocity, u^*_i (m/s)	Erosion Potential, P_i (g/m^2)	Uncontrolled Fugitive Emission Rate, R_i (tons/disturbance)		
						PM	PM_{10}	$PM_{2.5}$
550	18.8	10	18.78	1.00	0.00	0.00	0.00	0.00

Total Annual Erosion Potential

Emission Scenario	Fugitive Emission Rate (tons/year)			Fugitive Emission Rate (lb/event)		
	PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$
Total Uncontrolled, R	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Controlled, R_c	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**

Notes:

a) Threshold friction velocity based on AP-42 Table 13.2.5-2 value for Scoria (volcanic rock).

b) Assumed control efficiency of 50% based on fugitive dust control plant including best management practices.

c) No disturbances exceeded an Erosion Potential of zero (threshold friction velocity was not exceeded). The disturbance with maximum wind speed is shown in table.

d) Fastest mile wind speed data obtained from hourly National Climatic Data Center (NCDC) Quality Controlled Local Climatological Data (QCLCD) for Columbus, Mississippi for the year 2010. Hourly average wind speed was multiplied by a factor of 1.5 to estimate 5-second wind speed, according to the Durst curve for converting wind speeds.

Calculation Method & Sample Calculations (Based on AP-42 Chapter 13.2.5 - Industrial Wind Erosion):

$u^+_{10,i} = u^+_{z,i}\ (\ln(10/0.005) / \ln(z/0.005))$

$u^*_i = 0.0053\ u^+_{10,i}$

$P_i = 58\ (u^*_i - u_t^*)^2 + 25\ (u^*_i - u_t^*)$, for $u^*_i > u_t^*$

$P_i = 0$, for $u^*_i \le u_t^*$

$R_i = k\ P_i\ A$

$R = S^i\ R_i$

$R_c = R\ (1 - C)$

R_i = 0 tons = 1 * 0 g/m2 * 9135 m2 / (453.59 g/lb) / (2000 lb/ton)

R = sum of all R_i

R_c = 0 tons/year = 0 tons/year x (1 - 50%)

where:

$u^+_{10,i}$ = fastest mile wind speed for the i'th disturbance normalized to 10-m anemometer height

$u^+_{z,i}$ = fastest mile wind speed for the i'th disturbance measured at anemometer with height of z meters

u^*_i = friction velocity for the i'th disturbance

u_t^* = threshold friction velocity

P_i = erosion potential for the i'th disturbance

R_i = emission rate for the i'th disturbance

k = particle size multiplier

R = total uncontrolled annual emission rate

C = control efficiency (%)

R_c = controlled emission rate

Storage Pile Surface Area Calculation:

Assumed conical pile shape

Diameter, D (ft) = 250
Diameter, D (m) = 76.20
Height, H (ft) = 7
Height, H (m) = 2.13
Surface area, A (m^2) = 4,568
Number of Piles = 2
Total surface area, A (m^2) = 9,135

Table 2-7d
Mississippi Silicon, LLC.
Proposed Silicon Manufacturing Plant
Potential Emissions of Regulated Air Pollutants Due to Wind Erosion on Outdoor Slag Storage Areas - AA-403 (Criteria Air Pollutants)

Frequency of Disturbance (days/year)	365
Total Pile Surface Area, A (m^2)	91
Threshold Friction Velocity[a], u_t^* (m/s)	0.55
Anticipated Control Efficiency[b], C	50%

Particle Size Multiplier (k)		
PM	PM_{10}	$PM_{2.5}$
1	0.5	0.075

Erosion Potential During Each Disturbance

Disturbance Number[c], i	Fastest Mile Wind Speed for Disturbance[d], $u^+_{z,i}$ (m/s)	Reference Anemometer Height, z (m)	10-m Ref. Ht. Anemometer Fastest Mile, $u^+_{10,i}$ (m/s)	Friction Velocity, u^*_i (m/s)	Erosion Potential, P_i (g/m^2)	Uncontrolled Fugitive Emission Rate, R_i (tons/disturbance)		
						PM	PM_{10}	$PM_{2.5}$
162	10.7	10	10.73	0.57	0.49	4.89E-05	2.45E-05	3.67E-06

Total Annual Erosion Potential

Emission Scenario	Fugitive Emission Rate (tons/year)			Fugitive Emission Rate (lb/event)		
	PM	PM_{10}	$PM_{2.5}$	PM	PM_{10}	$PM_{2.5}$
Total Uncontrolled, R	9.87E-02	4.94E-02	7.40E-03	3.00E-04	1.50E-04	2.25E-05
Total Controlled, R_c	**4.94E-02**	**2.47E-02**	**3.70E-03**	**1.50E-04**	**7.50E-05**	**1.13E-05**

Notes:

a) Threshold friction velocity based on AP-42 Table 13.2.5-2 value for an "uncrusted coal pile".

b) Assumed control efficiency of 50% based on fugitive dust control plant including best management practices.

(c) Disturbances with Erosion Potential of zero (threshold friction velocity was not exceeded) are not shown in table.

d) Fastest mile wind speed data obtained from hourly National Climatic Data Center (NCDC) Quality Controlled Local Climatological Data (QCLCD) for Columbus, Mississippi for the year 2010. Hourly average wind speed was multiplied by a factor of 1.5 to estimate 5-second wind speed, according to the Durst curve for converting wind speeds.

Calculation Method & Sample Calculations (Based on AP-42 Chapter 13.2.5 - Industrial Wind Erosion):

$u^+_{10,i} = u^+_{z,i} (\ln(10/0.005) / \ln(z/0.005))$

$u^*_i = 0.0053\, u^+_{10,i}$

$P_i = 58 (u^*_i - u_t^*)^2 + 25 (u^*_i - u_t^*)$, for $u^*_i > u_t^*$

$P_i = 0$, for $u^*_i \le u_t^*$

$R_i = k\, P_i\, A$

$R = S^i R_i$

$R_c = R (1 - C)$

R_i = 0 tons = 1 * 0 g/m2 * 91 m2 / (453.59 g/lb) / (2000 lb/ton)

R = sum of all R_i

R_c = 0.05 tons/year = 0.1 tons/year x (1 - 50%)

where:

$u^+_{10,i}$ = fastest mile wind speed for the i'th disturbance normalized to 10-m anemometer height

$u^+_{z,i}$ = fastest mile wind speed for the i'th disturbance measured at anemometer with height of z meters

u^*_i = friction velocity for the i'th disturbance

u_t^* = threshold friction velocity

P_i = erosion potential for the i'th disturbance

R_i = emission rate for the i'th disturbance

k = particle size multiplier

R = total uncontrolled annual emission rate

C = control efficiency (%)

R_c = controlled emission rate

Storage Pile Surface Area Calculation:

Assumed conical pile shape

Diameter, D (ft) = 25
Diameter, D (m) = 7.62
Height, H (ft) = 0.7
Height, H (m) = 0.21
Surface area, A (m^2) = 46
Number of Piles = 2
Total surface area, A (m^2) = 91

Table 2-8
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Emissions of Regulated Air Pollutants from Diesel Fired Emergency Generators (Criteria Air Pollutants and HAPs)

AA-501 - Diesel-Fired Emergency Generators - 1 Generator Rated at 670 HP

Regulated Air Pollutant	Emission Factor[c]		Potential Emission Rate		Basis of Emission Estimate[c]
			Maximum Hourly	Annual	
	lb/hp-hr	g/hp-hr	lb/hr	ton/year	
SO_2	0.00809	3.67	5.4	0.27	AP-42, Table 3.4-1
H_2SO_4[a]	0.00062	0.281	0.41	0.021	AP-42, Table 3.4-1
NO_x	0.0007	0.30	0.4	0.02	EPA Final Tier 4
$PM/PM_{10}/PM_{2.5}$	0.00003	0.0149	0.02	0.001	EPA Final Tier 4
CO	0.0057	2.6	3.8	0.2	EPA Final Tier 4
VOC	0.00247	0.14	1.7	0.08	EPA Final Tier 4
Speciated Hazardous Air Pollutants					
Regulated Air Pollutant	**Emission Factor[c]**		**Potential Emission Rate**		**Basis of Emission Estimate[c]**
			Maximum Hourly	**Annual**	
	EF (lb/MMBtu)	EF (lb/bhp-hr)	lb/hr[d]	ton/year	
Benzene	9.33E-04	7.91E-06	5.30E-03	2.65E-04	AP-42, Table 3.3-2
Toluene	4.09E-04	3.47E-06	2.32E-03	1.16E-04	AP-42, Table 3.3-2
Xylene	2.85E-04	2.42E-06	1.62E-03	8.10E-05	AP-42, Table 3.3-2
1,3-Butadiene	3.91E-05	3.32E-07	2.22E-04	1.11E-05	AP-42, Table 3.3-2
Formaldehyde	**1.18E-03**	**1.00E-05**	**6.70E-03**	**3.35E-04**	**AP-42, Table 3.3-2**
Acetaldehyde	7.67E-04	6.50E-06	4.36E-03	2.18E-04	AP-42, Table 3.3-2
Acrolein	9.25E-05	7.84E-07	5.26E-04	2.63E-05	AP-42, Table 3.3-2
Naphthalene[b]	8.48E-05	7.19E-07	4.82E-04	2.41E-05	AP-42, Table 3.3-2
PAH (POM)[b]	1.68E-04	1.42E-06	9.55E-04	4.77E-05	AP-42, Table 3.3-2
HAP Total			**1.67E-02**	**1.10E-03**	**Sum of Speciated HAPs**

Power (bhp) = 670
Hours of operation (hr/year) = 100
Number of Generators = 1
Highest HAP emissions.

Pounds per Ton = 2000
Conversion of lb/hp-hr to g/hp-hr based on a conversion factor of 453.6
g/hp-hr = 0.00809 lb/hp-hr * 453.6 = 3.67 g/hp-hr
lb/bhp-hr = lb/MMBtu *0.002544 / 0.3

Notes:

a) Assumed that 5% of the uncontrolled sulfur dioxide is further oxidized to sulfur trioxide and combined with water to form sulfuric acid; adjustment factor

b) Regulated HAP is polycyclic organic matter (POM). AP-42 emission factor for PAH is assumed equivalent to POM for regulatory purposes. Naphthalene is excluded from HAP total because it is a subset of POM. POM is included in HAP total.

c) AP-42 Section 3.3 "Gasoline and Diesel Industrial Engines", Table 3.3-1 - Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines and Table 3.3-2 - Speciated Organic Compound Emission Factors for Uncontrolled Diesel Engines.

EPA Final Tier 4 Emission Factors - Emergency Generators 500 kW/650 HP

Pollutant	g/kw-hr	g/bhp-hr
NO_x	0.40	0.3
NMHC	0.19	0.14
CO	3.5	2.6
PM	0.02	0.0149

Conversion of g/kw-hr to g/bhp-hr based on a conversion factor of 0.7457
g/bhp-hr = 0.40 g/kw-hr * 0.7457 = 0.3 g/bhp-hr

Example Calculations

HAP Emission Factor (lb/bhp-hr) = Emission Factor (lb/MMBtu) * 0.002544 (MMBtu/bhp-hr) / 0.3 (Mechanical Efficiency)
Estimated Emissions (lb/hr) = Power (bhp) * Emission Factor (lb/bhp-hr) * Number of Emergency Generators
Estimated Emissions (ton/year) = Estimated Emissions (lb/hr) * Hours of Operation (hr/year) / (2000 lb/ton)

SO2 Emissions (lbs/hr) = 670 bhp * 3.67 g/hp-hr * 1 = 5.4 lbs/hr
SO2 Emissions (tons/year) = 5.4 lbs/hr * 100 hours/year / 2000 lbs = 0.27 tons/year

H2SO4 Emissions (lbs/hr) = 670 bhp * 0.28 g/hp-hr * 1 = 0.4 lbs/hr
H2SO4 Emissions (tons/year) = 0.4 lbs/hr * 100 hours/year / 2000 lbs = 0.02 tons/year

NOx Emissions (lbs/hr) = 670 bhp * 0.30 g/hp-hr * 1 = 0.4 lbs/hr
NOx Emissions (tons/year) = 0.4 lbs/hr * 100 hours/year / 2000 lbs = 0.02 tons/year

PM/PM10/PM2.5 Emissions (lbs/hr) = 670 bhp * 0.01 g/hp-hr * 1 = 0.0 lbs/hr
PM/PM10/PM2.5 Emissions (tons/year) = 0.0 lbs/hr * 100 hours/year / 2000 lbs = 0.00 tons/year

CO Emissions (lbs/hr) = 670 bhp * 2.60 g/hp-hr * 1 = 3.8 lbs/hr
CO Emissions (tons/year) = 3.8 lbs/hr * 100 hours/year / 2000 lbs = 0.19 tons/year

VOC Emissions (lbs/hr) = 670 bhp * 0.14 g/hp-hr * 1 = 1.7 lbs/hr
VOC (tons/year) = 1.7 lbs/hr * 100 hours/year / 2000 lbs = 0.08 tons/year

Table 2-8a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Potential Regulated Air Pollutant Emissions from Plant Support - Emergency Generator (Greenhouse Gases)

Emission Factor Table

Fuel	Fuel Classification	Higher Heating Value (HHV)			CO_2 Emission Factor (EF)			CH_4 Emission Fac	
		Value - HHV	Default - HHV	Units	Value - EF	Default - EF	Units	Value - EF	Defa E
Diesel	Petroleum Products	0.138	1.380E-01	MMBtu/gal	73.96	73.96	kg/MMBtu	0.003	3.0E

Notes:

a) Default values for diesel fuel were obtained from the EPA Greenhouse Gas Reporting Rule (10/30/2009) Tables C-1 and C-2. Table C-1 - Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel. Table C-2 - Default CH_4 and N_2O Emission Factors for Various Types of Fuel. Factors for CO_2 were taken from Table C-1 - Residual No. 2 Fuel Oil and factors for CH_4 and N_2O were taken from Table C-2 - Petroleum.

Annual GHG Calculation (By GHG Rule Eq. C-2a and C-2b)

Annual Fuel Use - Emergency Generator (gallons/yr)
2,800

Parameter	CO_2	CH_4	N_2O	TOTAL
EF[b] (kg/MMBtu)	73.96	0.003	0.0006	--
Estimated GHG Emissions (metric tons) - Emergency Generators	29	0.001	0.0002	--
Estimated GHG Emissions (tons) - Emergency Generators	**32**	**0.001**	**0.0003**	**--**
Global Warming Potential (GWP)[c] (kg CO_2e/kg)	1	21	310	--
Estimated GHG Emissions (metric tons CO_2e) - Emergency Generators	29	0.02	0.07	28.7
Estimated GHG Emissions (tons CO_2e) - Emergency Generators	**32**	**0.03**	**0.08**	**31.6**

Notes:

a) The default HHV value from Table C-1 of the EPA Greenhouse Gas Reporting Rule is substituted when no actual HHV data from fuel sampling is available. Use of the default HHV value constitutes the Tier 1 calculation method while use of HHV values obtained from fuel sampling constitutes Tier 2.

b) Emission factors (EF) for natural gas were obtained from Tables C-1 and C-2 of the EPA Greenhouse Gas Reporting Rule (40 CFR 98). Table C-1 - Default CO_2 Emission Factors and High Heat Values for Various Types of Fuel. Table C-2 - Default CH_4 and N_2O Emission Factors for Various Types of Fuel.

c) Global warming potentials (GWP) were obtained from Table A-1 of the EPA Greenhouse Gas Reporting Rule (40 CFR 98).

d)Cummins DSGAB Datasheet - 28.0 US gph at full load. 28.0 x 100 = 2,800 gallons

Example Calculations

Estimated GHG Emissions (metric tons) = Fuel Use (MMBtu/hr) * Emission Factor (kg/MMBtu) * High Heat Value (MMBtu/gal) * 0.001
Estimated GHG Emissions (metric tons CO_2e) = Estimated GHG Emissions (metric tons) * Global Warming Potential (kg CO_2e/kg)
Estimated GHG Emissions (tons CO_2e) = Estimated GHG Emissions (metric tons CO_2e) * 1.10231

CO2 Emissions (metric tons) = 0.00E+00 scf/year * 31.50 kg/MMBtu * MMBtu/scf * 0.001 = 01 metric tons CO2
CO2 Emissions (metric tons CO2e) = 01 metric tons CO2 * 28.578144 kg CO2e/kg = 32 metric tons CO2e
CO2 Emissions (tons CO2e) = 32 metric tons CO2e * 1.10231 = 00 tons CO2e

CH4 Emissions (metric tons) = 0.00E+00 scf/year * 0.001 kg/MMBtu * MMBtu/scf * 0.001 = 21.00 metric tons CH4
CH4 Emissions (metric tons CO2e) = 21.00 metric tons CH4 * 0.0243432 kg CO2e/kg = 0.03 metric tons CO2e
CH4 Emissions (tons CO2e) = 0.03 metric tons CO2e * 1.10231 = 0.00 tons CO2e

N2O Emissions (metric tons) = 0.00E+00 scf/year * 0.0003 kg/MMBtu * MMBtu/scf * 0.001 = 310.00 metric tons N2O
N2O Emissions (metric tons CO2e) = 310.00 metric tons N2O * 0.0718704 kg CO2e/kg = 0.08 metric tons CO2e
N2O Emissions (tons CO2e) = 0.08 metric tons CO2e * 1.10231 = 0.00 tons CO2e

Table 2-9
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Potential to Emit Regulated Air Pollutants from Silicon Manufacturing (Criteria Air Pollutants and HAPs)

Source Operation	Reference	Potential Potential to Emit Regulated[a] Emissions							
		PM	PM_{10}[c]	$PM_{2.5}$	NO_x	SO_2	CO	VOC	Pb
Material Transfer to and from Coal Storage Pile (AA-101)	Table 2-4	0.02	0.01	0.002	--	--	--	--	--
Material Transfer to and from Wood Storage Pile (AA-102)	Table 2-4	0.005	0.002	0.0003	--	--	--	--	--
Material Transfer to and from Quartz Storage Pile (AA-103)	Table 2-4	3.8	1.8	0.3	--	--	--	--	--
Limestone Material Handling (AA-104)	Table 2-4	0.0016	0.0008	0.0001					
Material Handling (Coal, Wood, Quartz) Baghouse (AA-101a, AA-102a, AA-103a)	Table 2-4a	6.8	6.8	6.8	--	--	--	--	--
Product Handling Area Baghouse (AA-301)	Table 2-4a	3.4	3.4	3.4	--	--	--	--	--
Submerged Arc Furnace (AA-201)[d]	Tables 2-2a, 2-2c & 2-2d	61.2	61.2	61.2	1892.2	2169.7	1429.6	92.5	0.08
Casting Frames (AA-201a)	Table 2-2e	0.1	0.1	0.1	--	--	--	--	--
Diesel Fired Emergency Generator (AA-501)	Table 2-8	0.001	0.001	0.001	0.02	0.27	0.19	0.083	--
Project Total PTE Excluding Fugitive Sources		**75.2**	**73.2**	**71.6**	**1892.2**	**2169.9**	**1429.8**	**92.6**	**0.08**
PSD Source Threshold Rates (tons per year)		**250**	**250**	**250**	**250**	**250**	**250**	**250**	**--**
Project Classified as PSD?		**No**	**No**	**No**	**YES**	**YES**	**YES**	**No**	**--**
PSD Major Source Threshold Rates (tons per year) and HAP Major Source Threshold (tons/year)		**25**	**15**	**10**	**40**	**40**	**100**	**40**	**0.6**
Pollutant Subject to PSD Review or Classified as a Major Source of HAPS?		**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**No**
Fugitive Source Operation[b]	**Reference**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**SO_2**	**CO**	**VOC**	**Pb**
Natural Gas Combustion - Ladle Pre-Heaters (AA-202)	Tables 2-3a and 2-3b	0.1	0.1	0.1	14.0	0.10	14.4	0.9	4.4E-0
Wood Chipper (AA-102b)	Table 2-4b	0.42	0.042	0.042	--	--	--	--	--
Silica Fume Silos (AA-404)	Table 2-4d	0.15	0.15	0.15	--	--	--	--	--
Storage Piles Processing (i.e., Bulldozing) (AA-105)	Table 2-5	9.2	1.7	0.2	--	--	--	--	--
In-plant Gravel Roads (AA-402)	Table 2-6	13.0	3.7	0.37	--	--	--	--	--
In-plant Paved Roads - Raw Material Transport (AA-402a)	Table 2-6a	1.1	0.3	0.3	--	--	--	--	--
Storage Piles Wind Erosion (AA-106 and AA-403)	Tables 2-7a, 2-7b, 2-7c, 2-7d	5.0	2.5	0.4	--	--	--	--	--
Total Fugitive Source PTE		**28.9**	**8.5**	**1.5**	**14.0**	**0.1**	**14.4**	**0.9**	**4.4E-0**
Project Total PTE Including Fugitive Sources		**104.1**	**81.8**	**73.1**	**1906.2**	**2170.1**	**1444.2**	**93.5**	**7.5E-0**

Notes:

(a) Ton per year (TPY) estimates based on appropriate average emission factor (i.e., lbs/MMBtu) and 8,760 hours per year. Short term emissions may exceed this average factor.

(b) "Fugitive emissions" means those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening. The fugitive emissions of a stationary source shall not be considered in determining whether it is a major station unless the source belongs to one of the designated categories of stationary sources. The proposed silicon manufacturing and purification plant is not one of the designated categories.

(c) Controlled emissions includes systems that are inherent to operation of the equipment (excludes fugitive source operations).

(d) Emissions from Pb based on coal and wood combustion in the SAF

Table 2-10
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Potential to Emit Regulated Air Pollutants from the Silicon Manufacturing Process (Hazardous Air Pollutants)

Pollutant	CAS Number	Estimated Emissions (tons/yr)				Total Estimated Potential Emissions (tons/yr)
		AA-001 - SAF - Coal Combustion	AA-001 - SAF - Wood Combustion	AA-001 - Natural Gas Combustion - Auxiliary Equipment	AA-001 - Diesel Fuel Auxiliary Equipment	
		Refer to Table 2-3	Refer to Table 2-3	Refer to Table 2-3	Refer to Table 2-3	
Formaldehyde	50000	1.26E-02	1.96E-01	1.29E-02	3.35E-04	2.22E-01
2-Methylnaphthalene	91576	--	--	4.12E-06	--	4.12E-06
3-Methylchloranthrene	56495	--	--	3.09E-07	--	3.09E-07
7,12-Dimethylbenz(a)anthracene	57976	--	--	2.75E-06	--	2.75E-06
Acenaphthene	83329	2.68E-05	1.01E-03	3.09E-07	--	1.03E-03
Acenaphthylene	208968	1.31E-05	5.53E-03	3.09E-07	--	5.55E-03
Acetophenone	98-86-2	7.88E-04	3.54E-06	--	--	7.92E-04
Anthracene	120127	1.10E-05	3.32E-03	4.12E-07	--	3.33E-03
Antimony	7440-36-0	9.46E-04	8.74E-03	--	--	9.69E-03
Arsenic	ARSENIC	2.15E-02	2.43E-02	3.44E-05	--	4.59E-02
Benz(a)anthracene	56553	4.20E-06	7.19E-05	3.09E-07	--	7.64E-05
Benz(a)pyrene	50328	2.00E-06	2.88E-03	2.06E-07	--	2.88E-03
Benzene	71432	6.83E-02	1.23E-02	3.61E-04	2.65E-04	8.12E-02
Benzo(b)fluoranthene	205992	--	1.11E-04	3.09E-07	--	1.11E-04
Benzo(b,j,k)fluoranthene	205992	5.78E-06	1.77E-04	--	--	1.83E-04
Benzo(e)pyrene	192-97-2	--	2.88E-03	--	--	2.88E-03
Benzo(g,h,i)perylene	191242	1.42E-06	1.03E-04	2.06E-07	--	1.05E-04
Benzo(k)fluoranthene	207089	--	3.98E-05	3.09E-07	--	4.01E-05
Benzyl chloride	100-44-7	3.68E-02	--	--	--	3.68E-02
Beryllium	BERYLLIUM	1.10E-03	1.22E-03	2.06E-06	--	2.32E-03
Biphenyl	92-52-4	8.94E-05	--	--	--	8.94E-05
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	3.84E-02	5.20E-05	--	--	3.84E-02
Bromoform	75-25-2	2.05E-03	--	--	--	2.05E-03
Cadmium	CADMIUM	2.68E-03	4.54E-03	1.89E-04	--	7.41E-03
Carbon disulfide	75-15-0	6.83E-03	--	--	--	6.83E-03
Carbon tetrachloride	56-23-5	--	4.98E-02	--	--	4.98E-02
Chlorine	7782-50-5	--	8.74E-01	--	--	8.74E-01
2-Chloroacetophenone	532-27-4	3.68E-04	--	--	--	3.68E-04
Chlorobenzene	108-90-7	1.16E-03	3.65E-02	--	--	3.77E-02
Chloroform	67-66-3	3.10E-03	3.10E-02	--	--	3.41E-02
Chromium	CHROMIUM	1.37E-02	2.32E-02	2.40E-04	--	3.71E-02
Chrysene	218019	5.26E-06	4.20E-05	3.09E-07	--	4.76E-05
Cobalt	COBALT	5.26E-03	7.19E-03	1.44E-05	--	1.25E-02
Cumene	98-82-8	2.79E-04	--	--	--	2.79E-04
Cyanide	75-90-8	1.31E-01	--	--	--	1.31E-01
Decachlorobiphenyl	2051-24-3	--	2.99E-07			2.99E-07
Dibenzo(a,h)anthracene	53703	--	1.01E-05	2.06E-07	--	1.03E-05
Dichlorobenzene	106467	--	--	2.06E-04	--	2.06E-04
Dichloromethane	75-09-2	--	3.21E-01	--	--	3.21E-01
Dimethyl sulfate	77-78-1	2.52E-03	--	--	--	2.52E-03
2,4-Dinitrotoluene	121-14-2	1.47E-05	1.99E-04	--	--	2.14E-04
Ethyl Benzene	100-41-4	4.94E-03	3.43E-02	--	--	3.92E-02
Ethyl chloride	75-00-3	2.21E-03	--	--	--	2.21E-03
Ethylene dichloride	107-06-2	2.10E-03	--	--	--	2.10E-03
Ethylene Dibromide	106-93-4	6.31E-05	--	--	--	6.31E-05
Fluoranthene	206440	3.73E-05	1.77E-03	5.15E-07	--	1.81E-03
Fluorene	86737	4.78E-05	3.76E-03	4.81E-07	--	3.81E-03
Hexane	110543	3.52E-03	--	3.09E-01	--	3.13E-01
Hydrochloric Acid	**7647010**	**--**	**9.63E+00**	**--**	**--**	**9.63E+00**
Indeno(1,2,3-cd)pyrene	193395	3.21E-06	9.63E-05	3.09E-07	--	9.98E-05
Isophorone	78-59-1	3.05E-02	--	--	--	3.05E-02
Manganese	MANGANESE	2.58E-02	2.74E-01	6.53E-05	--	3.00E-01
Mercury	MERCURY	4.36E-03	3.87E-03	4.47E-05	--	8.28E-03
Methyl Bromide	74-83-9	8.41E-03	1.66E-02	--	--	2.50E-02
Methyl Chloride	74-87-3	2.79E-02	2.54E-02	--	--	5.33E-02
Methyl Ethyl Ketone	78-93-3	2.05E-02	5.97E-03	--	--	2.65E-02
Methyl Hydrazine	60-34-4	8.94E-03	--	--	--	8.94E-03
Methyl methacrylate	80-62-6	1.05E-03	--	--	--	1.05E-03
Methyl tert-butyl Ether	1634-04-4	1.84E-03	--	--	--	1.84E-03
Methylene Chloride	75-09-2	1.52E-02	--	--	--	1.52E-02
Naphthalene	91203	6.83E-04	--	1.05E-04	--	7.88E-04
Nickel	NICKEL	1.47E-02	3.65E-02	3.61E-04	--	5.16E-02
4-Nitrophenol	100-02-7	--	1.22E-04			1.22E-04
Phenanathrene	85018	1.42E-04	7.74E-03	2.92E-06	--	7.89E-03
Phenol	108-95-2	8.41E-04	5.64E-02	--	--	5.73E-02
Propionaldehyde	123-38-6	2.00E-02	6.75E-02	--	--	8.75E-02
Pyrene	129000	1.73E-05	--	8.59E-07	--	1.82E-05
Selenium	SELENIUM	6.83E-02	3.10E-03	4.12E-06	--	7.14E-02
Tetrachloroethylene	127-18-4	2.26E-03		--	--	2.26E-03
Toluene	108883	1.26E-02	5.09E-03	5.84E-04	1.16E-04	1.84E-02
1,1,1-Trichloroethane	71-55-6	1.05E-03	--	--	--	1.05E-03
2,4,6-Trichlorophenol	88-06-2	--	2.43E-05	--	--	2.43E-05
Styrene	100-42-5	1.31E-03	6.20E-04	--	--	1.93E-03
Xylenes	1330207	1.94E-03	2.77E-02	--	8.10E-05	2.97E-02
Vinyl acetate	108-05-4	3.99E-04	--	--	--	3.99E-04
Vinyl Chloride	75-01-	--	1.99E-02	--	--	1.99E-02
1,3-Butadiene	106990	--	--	--	1.11E-05	1.11E-05
Acetaldehyde	75070	3.00E-02	9.18E-01	--	2.18E-04	9.48E-01
Acrolein	107028	1.52E-02	1.08E-02	--	2.63E-05	2.61E-02
Naphthalene*	91203	--	1.07E-01	--	2.41E-05	1.07E-01
PAH (POM)*	POLYCYCLIC ORGANIC MATTER	--		--	4.77E-05	4.77E-05
Lead	Lead Compounds	2.21E-02	5.31E-02	4.38E-08	--	7.52E-02
Total HAPs		**0.70**	**12.91**	**0.32**	**0.002**	**13.94**

13.94

[ ] = Highest individual HAP emission rate

*Regulated HAP is polycyclic organic matter (POM). AP-42 emission factor for PAH is assumed equivalent to POM for regulatory purposes. Naphthalene is excluded from diesel HAP total because it is a subset of POM. POM is included in HAP total.

Table 2-11
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Potential to Emit Regulated Air Pollutants from the Silicon Manufacturing Process (Greenhouse Gases)

Estimated Potential to Emit (PTE) Criteria Air Contaminants (tons per year) - Silicon Manufacturing Process						
Source Operation	Reference	Estimated Potential to Emit (tons/year)			Estimated Potential (tons CO_2e)	
		CO_2	CH_4	N_2O	CO_2	CH_4
Submerged Arc Furnaces (AA-201)	Table 2-2b	381,866.12	--	--	381,866.12	--
Natural Gas-Fired Combustion Sources (AA-202)	Table 2-3c	20,478.94	0.39	0.04	20,478.94	8.11
Emergency Generator (AA-501)	Table 2-8a	31.50	0.001	0.000	31.50	0.03
Total GHG Emissions - Silicon Manufacturing Process		402,376.57	0.39	0.04	402,376.57	8.14

Table 3-1
Mississippi Silicon, LLC.
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Applicable and Non-Applicable Federal Air Pollution Regulations

40 C.F.R. Part 50	National Primary and Secondary Ambient Air Quality Standards
40 C.F.R. Part 51	Requirements for Preparation, Adoption and Submittal of Implementation Plans
40 C.F.R. Part 52	Approval and Promulgation of Implementation Plans
40 C.F.R. Part 53	Ambient Air Monitoring Reference and Equivalent Methods
40 C.F.R. Part 54	Prior Notice of Citizen Suits
40 C.F.R. Part 55	Outer Continental Shelf Air Regulations
40 C.F.R. Part 56	Regional Consistency
40 C.F.R. Part 57	Primary Nonferrous Smelter Orders
40 C.F.R. Part 58	Ambient Air Quality Surveillance
40 C.F.R. Part 59	National Volatile Organic Compound Emission Standards for Consumer and Commercial Products
40 C.F.R. Part 60	**Standards of Performance for New Stationary Sources**
40 C.F.R. Part 61	National Emission Standards for Hazardous Air Pollutants
40 C.F.R. Part 62	Approval and Promulgation of State Plans for Designated Facilities and Pollutants
40 C.F.R. Part 63	**National Emission Standards for Hazardous Air Pollutants for Source Categories**
40 C.F.R Part 64	Compliance Assurance Monitoring
40 C.F.R. Part 65	Consolidated Federal Air Rule
40 C.F.R. Part 66	Assessment and Collection of Noncompliance Penalties by EPA
40 C.F.R. Part 67	EPA Approval of State Noncompliance Penalty Program
40 C.F.R. Part 68	Chemical Accident Prevention Provisions
40 C.F.R. Part 69	Special Exemptions from Requirements of the Clean Air Act
40 C.F.R. Part 70	State Operating Permit Programs
40 C.F.R. Part 71	Federal Operating Permit Programs
40 C.F.R. Parts 72,73,74,75,76,77 and 78	Permits Regulation (Part 72)
40 C.F.R. Parts 79 and 80	Registration and Regulation of Fuels and Fuel Additives (Sulfur Limits for Gasoline and Diesel Fuel)
40 C.F.R. Part 81	Designation of Areas for Air Quality Planning Purposes
40 C.F.R. Part 82	Protection of Stratospheric Ozone
40 C.F.R. Part 85	Control of Air Pollution from Mobile Sources

Table 3-1
Mississippi Silicon, LLC.
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Applicable and Non-Applicable Federal Air Pollution Regulations

40 C.F.R. Part 86	Control of Emissions from New and In-Use Highway Vehicles and Engines
40 C.F.R. Part 87	Control of Air Pollution from Aircraft and Aircraft Engines
40 C.F.R. Part 88	Clean-Fuel Vehicles
40 C.F.R. Part 89	Control of Emissions from New and In-Use Nonroad Compression-Ignition Engines
40 C.F.R. Part 90	Control of Emissions from Nonroad Spark-Ignition Engines at or below 19 Kilowatts
40 C.F.R. Part 91	Control of Emissions from Marine Spark-Ignition Engines
40 C.F.R. Part 92	Control of Air Pollution from Locomotives and Locomotive Engines
40 C.F.R. Part 93	Determining Conformity of Federal Actions to State or Federal Implementation Plans
40 C.F.R. Part 94	Control of Air Pollution from Marine Compression-Ignition Engines
40 C.F.R. Part 95	Mandatory Patent Licenses
40 C.F.R. Part 96	NO_x Budget Trading Program and CAIR NO_x and SO_2 Trading Programs for State Implementation Plans
40 C.F.R. Part 97	Federal NO_x Budget Trading Program and CAIR NO_x and SO_2 Trading Programs
40 C.F.R. Part 98	Mandatory Green House Gas Reporting
40 C.F.R. Part 99	Reserved

Notes:

Shaded items identify those Federal air regulations that contain emission standards or limits, monitoring or testing requirements, or other relevant requirements that are intended to protect human health and welfare and have been determined to be applicable to the proposed silicon manufacturing facility for Mississippi Silicon, LLC located in Burnsville, Mississippi.

Non-shaded regulations have been determined to be not applicable to the proposed silicon manufacturing facility for Mississippi Silicon, LLC located in Burnsville, Mississippi.

Table 3-2a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Applicable New Source Performance Standards (NSPS)

Subpart Designation	Promulgated NSPS Standard (40 CFR Part 60)	
A	**General Provisions**	
B	Adoption and Submittal of State Plans for Designate Facilities	
C	Emission Guidelines for Compliance Times	
Ca	Reserved	
Cb	Emission Guidelines and Compliance Times for Municipal Waste Combusters That Are Constructed on or Before September 20, 1994	
Cc	Emission Guidelines for Compliance Times for Municipal Solid Waste Landfills	
Cd	Emission Guidelines for Compliance Times for Sulfuric Acid Production Units	
Ce	Emission Guidelines for Compliance Times for Hospital/Medical/Infectious Waste Incinerators	
D	Fossil Fuel Fired Steam Generators for which Construction is Commenced After August 17, 1971	
Da	Electric Utility Steam Generator Units for which Construction is Commenced After September 18, 1978	
Db	Industrial, Commercial, Institutional Steam Generating Units	
Dc	Small Industrial, Commercial, Institutional Steam Generating Units	
E	Incinerators	
Ea	Municipal Waste Combusters for Which Construction is Commenced After December 20, 1989 and On or Before September 20, 1994	
Eb	Large Municipal Waste Combustors for Which Construction is Commenced After September 20, 1994 or for Which Modification or Reconstruction is Commenced After June 19, 1996	
Ec	Hospital/Medical/Infectious Waste Incinerators for which Construction is Commenced on or after June 20, 1996	
F	Portland Cement Plants	
G	Nitric Acid Plants	
H	Sulfuric Acid Plants	
I	Hot Mix Asphalt Plants	
J	Petroleum Refineries	
Ja	Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007	
K	Storage Vessels for Petroleum Liquids for which Construction, Reconstruction or Modification Commenced On or After June 11, 1973 and Prior to May 19, 1978	
Ka	Storage Vessels for Petroleum Liquids for which Construction, Reconstruction or Modification Commenced After May 18, 1978 and Prior July 23, 1984.	
Kb	Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for which Construction, Reconstruction or Modification Commenced After July 23, 1984	
L	Secondary Lead Smelters	
M	Secondary Brass and Bronze Production Plants	
N	Primary Emissions from Basic Oxygen Process Furnaces for which Construction is Commenced After June 11, 1973	
Na	Secondary Emissions from Basic Oxygen Steelmaking Facilities for which Construction is Commenced After January 20, 1983	
O	Sewage Treatment Plants	
P	Primary Copper Smelters	
Q	Primary Zinc Smelters	
R	Primary Lead Smelters	
S	Primary Aluminum Reduction Plants	
T	Phosphate Fertilizer Industry - Wet Process Phosphoric Acid Plants	

Table 3-2a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Applicable New Source Performance Standards (NSPS)

Subpart Designation	Promulgated NSPS Standard (40 CFR Part 60)	
U	Phosphate Fertilizer Industry - Superphosphoric Acid Plants	
V	Phosphate Fertilizer Industry - Diammonium Phosphate Plants	
W	Phosphate Fertilizer Industry - Triple Superphosphate Plants	
X	Phosphate Fertilizer Industry - Granular Triple Superphosphate Storage Facilities	
Y	Coal Preparation and Processing Plants	
Z	**Ferroalloy Production Facilities**	
AA	Steel Plants - Electric Arc Furnaces Constructed After October 21, 1974 and On or Before August 17, 1983	
AAa	Steel Plants - Electric Arc Furnaces and Argon Oxygen Decarbonization Vessels Constructed After August 17, 1983	
BB	Kraft Pulp Mills	
CC	Glass Manufacturing Plants	
DD	Grain Elevators	
EE	Surface Coating of Metal Furniture	
FF	Reserved	
GG	Stationary Gas Turbines	
HH	Lime Manufacturing Plants	
KK	Lead Acid Battery Manufacturing Plants	
LL	Metallic Mineral Processing Plants	
MM	Automobile and Light Duty Truck Surface Coating Operations	
NN	Phosphate Rock Plants	
PP	Ammonium Sulfate Manufacture	
QQ	Graphic Arts Industry - Publication Rotogravure Printing	
RR	Pressure Sensitive Tape and Label Surface Coating Operations	
SS	Industrial Surface Coating of Large Appliances	
TT	Metal Coil Surface Coating	
UU	Asphalt Processing and Asphalt Roofing Manufacture	
VV	Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry (SOCMI) for Which Construction, Reconstruction, or Modification Commenced After January 5, 1981, and On or Before November 7, 2006	
VVa	Equipment Leaks of VOC in the SOCMI Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006	
WW	Beverage Can Surface Coating Industry	
XX	Bulk Gasoline Terminals	
AAA	New Residential Wood Heaters	
BBB	Rubber Tire Manufacturing Industry	
CCC	Reserved	
DDD	VOC Emission from the Polymer Manufacturing Industry	
EEE	Reserved	
FFF	Flexible Vinyl and Urethane Coating and Printing	
GGG	Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After January 4, 1983, and On or Before November 7, 2006	
GGGa	Equipment Leaks of VOC in Petroleum Refineries for which Construction, Reconstruction, or Modification Commenced After November 7, 2006	
HHH	Synthetic Fiber Production Facilities	

Table 3-2a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Applicable New Source Performance Standards (NSPS)

Subpart Designation	Promulgated NSPS Standard (40 CFR Part 60)	
III	VOC Emissions from the SOCMI Air Oxidation Unit Processes	
JJJ	Petroleum Dry Cleaners	
KKK	Equipment Leaks of VOC from Onshore Natural Gas Processing Plants	
LLL	Onshore Natural Gas Processing - SO2 Emissions	
MMM	Reserved	
NNN	VOC Emissions from SOCMI Distillation Operations	
OOO	Nonmetallic Mineral Processing Plants	
PPP	Wool Fiberglass Insulation Manufacturing Plants	
QQQ	VOC Emissions from Petroleum Refinery Wastewater Systems	
RRR	VOC Emission from SOCMI Reactor Processes	
SSS	Magnetic Tape Coating Facilities	
TTT	Industrial Surface Coating - Surface Coating of Plastic Parts for Business Machines	
UUU	Calciners and Dryers in Mineral Industries	
VVV	Polymeric Coating of Supporting Substrates Facilities	
WWW	Municipal Solid Waste Landfills	
AAAA	Small Municipal Waste Combustion Units for which Construction Commenced After August 30, 1999 or Which Modification or Reconstruction is Commenced After June 6, 2001	
BBBB	Emission Guidelines and Compliance Times for Small Municipal Waste Combustion Units for Which Construction Commenced On or Before August 30, 1999	
CCCC	Commercial and Industrial Solid Waste Incineration Units for which Construction is Commenced After November 30, 1999 or for Which Modification or Reconstruction is Commenced On or After June 1, 2001	
DDDD	Emission Guidelinds and Compliance Times for Commercial and Industrial Solid Waste Incineration Units for which Construction is Commenced On or Before November 30, 1999	
EEEE	Other Solid Waste Incineration Units for which Construction is Commenced After December 9, 2004 or for Which Modification or Reconstruction is Commenced On or After June 16, 2006	
FFFF	Emission Guidelines and Compliance Times for Other Solid Waste Incineration Units that Commenced Construction On or Before December 9, 2004	
GGGG	Reserved	
HHHH	Emission Guidelines and Compliance Times for Coal-Fired Electric Steam Generating Units	
IIII	**Stationary Compression Ignition Internal Combustion Engines**	
JJJJ	Stationary Spark Ignition Internal Combustion Engines	
KKKK	Stationary Combustion Turbines	
LLLL	New Sewage Sludge Incineration Units	
MMMM	Emission Guidelines and Compliance Times for Existing Sewage Sludge Incineration Units	

Existing requirement applicable to the proposed silicon manufacturing facility

Table 3-2b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart Z - Standards of Performance for Ferroalloy Production Facilities
Applicability and Definitions

§ 60.260 Applicability and Designation of Affected Facility

(a) Applicable to the following affected facilities: **Electric submerged arc furnaces which produce silicon metal**, ferrosilicon, calcium silicon, silicomanganese zirconium, ferrochrom charge chrome, standard ferromanganese, silicomanganese, ferromanganese silicon, or calcium carbide; and dust-handling equipment.

(b) Applies to any facility that **commences construction** or modification **after October 21, 1974.**

§ 60.261 Definitions

(a) **Electric submerged arc furnace** means any furnace wherein electrical energy is converted to heat energy by transmission of current between electrodes partially submerged in

(k) **Dust-handling equipment** means any equipment used to handle particulate matter collected by the air pollution control device (and located at or near such device) serving any subpart.

(l) **Control device** means the air pollution control equipment used to remove particulate matter generated by an electric submerged arc furnace from an effluent gas stream.

(m) **Capture system** means the equipment (including hoods, ducts, fans, dampers, etc.) used to capture or transport particulate matter generated by an affected electric submerge

(x) **Silicon metal** means any silicon alloy containing more than 96 percent silicon by weight.

Table 3-2b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart Z - Standards of Performance for Ferroalloy Production Facilities
Applicable Standards for Particulate Matter (PM)

Pollutant
Particulate Matter (PM)
§ 60.262 Standards for Particulate Matter (PM)
(a) On and after the date on which the performance test required to be conducted by §60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause electric submerged arc furnace any gases which: (1) **Exit from a control device and contain particulate matter in excess of 0.45 kg/MW-hr (0.99 lb/MW-hr) while silicon metal,** ferrosilicon, calcium silicon, or silicomanganese zir (3) **Exit from a control device and exhibit 15 percent opacity or greater.** (4) Exit from an electric submerged arc furnace and escape the capture system and are visible without the aid of instruments. The requirements under this paragraph apply only d established under § 60.265(d). (5) Escape the capture system at the tapping station and are visible without the aid of instruments for more than 40 percent for each tapping period. There are no limitations or vi blowing tap occurs. he requirements under this paragraph apply only during periods when flow rates are being established under § 60.265(d). (6) On and after the date on which the performance test required to be conducted by §60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause dust-handling equipment any gases which exhibit 10 percent opacity or greater.

Table 3-2b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart Z - Standards of Performance for Ferroalloy Production Facilities
Applicable Standards for Carbon Monoxide (CO)

Pollutant
Carbon Monoxide (CO)
§ 60.263 Standards for Carbon Monoxide (CO)
(a) On and after the date on which the performance test required to be conducted by §60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause electric submerged arc furnace any gases which contain, **on a dry basis, 20 or greater volume percent of carbon monoxide.** Combustion of such gases under conditions acceptabl with this section. **Acceptable conditions include, but are not limited to, flaring of gases or use of gases as fuel for other processes.**

§ 60.264 Emissions Monitoring

(a) The owner or operator subject to the provisions of this subpart shall **install, calibrate, maintain and operate a continuous monitoring system for measurement of the opacity of emissions dischar**

(b) For the purpose of reports required under §60.7(c), the owner or operator shall report as excess emissions all six-minute periods in which the average opacity is 15 percent or greater.

(c) The owner or operator subject to the provisions of this subpart shall submit a written report of any product change to the Administrator. Reports of product changes must be postmarked not later change.

§ 60.265 Monitoring of Operations

(a) The owner or operator of any electric submerged arc furnace subject to the provisions of this subpart shall **maintain daily records** of the following information:

(1) Product being produced.
(2) Description of constituents of furnace charge, including the quantity, by weight.
(3) Time and duration of each tapping period and the identification of material tapped (slag or product.)
(4) All furnace power input data obtained under paragraph (b) of this section.
(5) All flow rate data obtained under paragraph (c) of this section or all fan motor power consumption and pressure drop data obtained under paragraph (e) of this section.

(b) The owner or operator subject to the provisions of this subpart shall **install, calibrate, maintain, and operate a device to measure and continuously record the furnace power input.** The furnace power input may be meas device must have an accuracy of +/- 5 percent over its operating range.

(c) The owner or operator subject to the provisions of this subpart shall **install, calibrate, and maintain a monitoring device that continuously measures and records the volumetric flow rate through each separately ducted** paragraph (e) of this section. The owner or operator of an electric submerged arc furnace that is equipped with a water cooled cover which is designed to contain and prevent escape of the generated gas and particulate matt capture system for control of emissions from the tapping station. The owner or operator may install the monitoring device(s) in any appropriate location in the exhaust duct such that reproducible flow rate monitoring will res of +/- 10 percent over its normal operating range and must be calibrated according to the manufacturer's instructions. The Administrator may require the owner or operator to demonstrate the accuracy of the monitoring dev

(d) When performance tests are conducted under the provisions of §60.8 of this part to demonstrate compliance with the standards under §§60.262(a) (4) and (5), the volumetric flow rate through each separately ducted hoo monitoring device required under paragraph (c) of this section. The **volumetric flow rates must be determined for furnace power input levels at 50 and 100 percent of the nominal rated capacity of the electric submerged a is operated, the owner or operator shall maintain the volumetric flow rate at or above the appropriate levels for that furnace power input level determined during the most recent performance test.** If emissions due to ta the electric submerged arc furnace, during each tapping period the owner or operator shall maintain the exhaust flow rates through the capture system over the tapping station at or above the levels established during the mo may be considered by the Administrator to be unacceptable operation and maintenance of the affected facility. The owner or operator may request that these flow rates be reestablished by conducting new performance tests

(e) The owner or operator may as an alternative to paragraph (c) of this section determine the volumetric flow rate through each fan of the capture system from the fan power consumption, pressure drop across the fan and th of the affected electric submerged arc furnace are acceptable for demonstration of compliance with the requirements of this paragraph. The owner or operator shall maintain on file a permanent record of the fan performance

(1) Install, calibrate, maintain, and operate a device to continuously measure and record the power consumption of the fan motor (measured in kilowatts), and

(2) Install, calibrate, maintain, and operate a device to continuously measure and record the pressure drop across the fan. The fan power consumption and pressure drop measurements must be synchronized to allow real time an accuracy of ±5 percent over their normal operating ranges.

(f) **The volumetric flow rate through each fan of the capture system must be determined from the fan power consumption, fan pressure drop, and fan performance curve** specified under paragraph (e) of this section, durin demonstrate compliance with the standards under §§60.262(a)(4) and (5). The owner or operator shall **determine the volumetric flow rate at a representative temperature for furnace power input levels of 50 and 100 perce arc furnace. At all times the electric submerged arc furnace is operated, the owner or operator shall maintain the fan power consumption and fan pressure drop at levels such that the volumetric flow rate is at or above t test for that furnace power input level**. If emissions due to tapping are captured and ducted separately from emissions of the electric submerged arc furnace, during each tapping period the owner or operator shall maintain t such that the volumetric flow rate is at or above the levels established during the most recent performance test. Operation at lower flow rates may be considered by the Administrator to be unacceptable operation and mainte request that these flow rates be reestablished by conducting new performance tests under §60.8. The Administrator may require the owner or operator to verify the fan performance curve by monitoring necessary fan operati relative to Methods 1 and 2 of appendix A to this part.

(g) **All monitoring devices** required under paragraphs (c) and (e) of this section are to be **checked for calibration annually** in accordance with the procedures under §60.13(b).

§ 60.266 Test Methods and Procedures

(a) During any performance test required in §60.8, the owner or operator shall not allow gaseous diluents to be added to the effluent gas stream after the fabric in an open pressurized fabric filter collector unless the tota and considered in the determination of emissions.

(b) In conducting the performance tests required in §60.8, the owner or operator shall use as reference methods and procedures the test methods in appendix A of this part or other methods and procedures as specified i

(c) The owner or operator shall determine compliance with the particulate matter standards in §60.262 as follows:

(1) The emission rate (E) of particulate matter shall be computed for each run using the following equation:

$E = [(^{N}\sum_{i=1} C_{si} Q_{sdi})] / (PK)$

where:

E=emission rate of particulate matter, kg/MW-hr (1b/MW-hr).

n=total number of exhaust streams at which emissions are quantified.

csi=concentration of particulate matter from exhaust stream "i", g/dscm (gr/dscf).

Qsdi=volumetric flow rate of effluent gas from exhaust stream "i", dscm/hr (dscf/hr).

P=average furnace power input, MW.

K=conversion factor, 1000 g/kg (7000 gr/lb).

(2) Method 5 shall be used to determine the particulate matter concentration (csi) and volumetric flow rate (Qsdi) of the effluent gas, except that the heating systems specified in sections 2.1.2 and 2.1.6 are not to be use exceeds 10 percent by volume, dry basis. If a flare is used to comply with §60.263, the sampling site shall be upstream of the flare. The sampling time shall include an integral number of furnace cycles.

(i) When sampling emissions from open electric submerged arc furnaces with wet scrubber control devices, sealed electric submerged arc furnaces, or semi enclosed electric arc furnaces, the sampling time and sample vo (63.6 dscf).

(ii) When sampling emissions from other types of installations, the sampling time and sample volume for each run shall be at least 200 minutes and 5.66 dscm (200 dscf).

(3) The measurement device of §60.265(b) shall be used to determine the average furnace power input (P) during each run.

(4) Method 9 and the procedures in §60.11 shall be used to determine opacity.

(5) The emission rate correction factor, integrated sampling procedure of Method 3B shall be used to determine the CO concentration. The sample shall be taken simultaneously with each particulate matter sample.

(d) During the particulate matter run, the maximum open hood area (in hoods with segmented or otherwise moveable sides) under which the process is expected to be operated and remain in compliance with all standar system with open areas in excess of the maximum is not permitted.

(e) To comply with §60.265 (d) or (f), the owner or operator shall use the monitoring devices in §60.265 (c) or (e) to make the required measurements as determined during the performance test.

Table 3-2b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart A - Applicable Performance Testing Requirements

NSPS Subpart
40 CFR Part 60 Subpart A - General Provisions
Applicable Performance Testing Requirements
§ 60.8 Performance Tests (a) Except as specified in paragraphs (a)(1),(a)(2), (a)(3), and (a)(4) of this section, within 60 days after achieving the maximum production rate at which the **affected facility** will be operated, but not lat or at such other times specified by this part, and at such other times as may be required by the Administrator under section 114 of the Act, the owner or operator of such facility shall conduct perform report of the results of such performance test(s). (b) Performance tests shall be conducted and data reduced in accordance with the test methods and procedures contained in each applicable subpart unless the Administrator (1) specifies or approves minor changes in methodology, (2) approves the use of an equivalent method, (3) approves the use of an alternative method the results of which he has determined to be adequate for indicating whet requirement for performance tests because the owner or operator of a source has demonstrated by other means to the Administrator's satisfaction that the **affected facility** is in compliance with the s smaller sample volumes when necessitated by process variables or other factors. Nothing in this paragraph shall be construed to abrogate the Administrator's authority to require testing under section (c) Performance tests shall be conducted under such conditions as the Administrator shall specify to the plant operator based on representative performance of the **affected facility**. The owner or oper records as may be necessary to determine the conditions of the performance tests. Operations during periods of **startup**, **shutdown**, and **malfunction** shall not constitute representative conditions for in excess of the level of the applicable emission limit during periods of startup, shutdown, and malfunction be considered a violation of the applicable emission limit unless otherwise specified in the ap (d) The owner or operator of an **affected facility** shall provide the Administrator at least 30 days prior notice of any performance test, except as specified under other subparts, to afford the Administra after 30 days notice for an initially scheduled performance test, there is a delay (due to operational problems, etc.) in conducting the scheduled performance test, the owner or operator of an **affected** State or local agency) as soon as possible of any delay in the original test date, either by providing at least 7 days prior notice of the rescheduled date of the performance test, or by arranging a resched or local agency) by mutual agreement.

Applicable Definition(s):

Affected facility means, with reference to a stationary source, any apparatus to which a standard is applicable (§60.2).

Affected facility (§60.40Da(a)) - Except as specified in paragraph (e) of this section, the affected facility to which this subpart applies is each electric utility steam generating unit:
(1) That is capable of combusting more than 73 megawatts (MW) (250 million British thermal units per hour (MMBtu/hr)) heat input of fossil fuel (either alone or in combination with any other fuel); and
(2) For which construction, modification, or reconstruction is commenced after September 18, 1978.

Malfunction means any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Failures that are caused in part b malfunctions (§60.2).

Shutdown means the cessation of operation of an affected facility for any purpose (§60.2).

Startup means the setting in operation of an affected facility for any purpose (§60.2).

Table 3-2c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
Applicability and Definitions

§ 60.4200 Am I Subject to This Subpart?

(a) Applicable to manufacturers, owners, and operators of **stationary compression ignition (CI) internal combustion engines (ICE)** and other persons as specified in paragraphs (a) of this subpart, the date that construction commences is the date the engine is ordered by the owner or operator.

(1) Manufacturers of stationary CI ICE with a displacement of less than 30 liters per cylinder where the model year is:
(i) 2007 or later, for engines that are not fire pump engines;
(ii) The model year listed in Table 3 to this subpart or later model year, for fire pump engines.

(2) Owners and operators of stationary CI ICE that commence construction after July 11, 2005, where the stationary CI ICE are:
(i) Manufactured after April 1, 2006, and are not fire pump engines, or
(ii) Manufactured as a certified National Fire Protection Association (NFPA) fire pump engine after July 1, 2006.

(3) Owners and operators of any stationary CI ICE that are modified or reconstructed after July 11, 2005 and any person that modifies or reconstructs any stationary CI ICE after Jul

(4) The provisions of §60.4208 of this subpart are applicable to all owners and operators of stationary CI ICE that commence construction after July 11, 2005.

§ 60.4219 What Definitions Apply to this Subpart?

Compression ignition means relating to a type of stationary internal combustion engine that is not a spark ignition engine.

Emergency stationary internal combustion engine means any stationary internal combustion engine whose operation is limited to emergency situations and required testing and used to produce power for critical networks or equipment (including power supplied to portions of a facility) when electric power from the local utility (or the normal power source production) is interrupted, or stationary ICE used to pump water in the case of fire or flood, etc. Stationary CI ICE used to supply power to an electric grid or that supply power as p entity are not considered to be emergency engines.

Stationary internal combustion engine means any internal combustion engine, except combustion turbines, that converts heat energy into mechanical work and is not mobile. Sta stationary internal combustion engine is not a nonroad engine as defined at 40 CFR 1068.30 (excluding paragraph (2)(ii) of that definition), and is not used to propel a motor vehicl competition. Stationary ICE include reciprocating ICE, rotary ICE, and other ICE, except combustion turbines.

Table 3-2c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
Emission Standards

§ 60.4205 What Emission Standards Must I Meet for Emergency Engines If I am an owner or operator of a stationary CI internal combustion engine?

(a) Owners and operators of pre-2007 model year emergency stationary CI ICE with a displacement of less than 10 liters per cylinder that are not fire pump engines must comply w subpart. Owners and operators of pre-2007 model year emergency stationary CI ICE with a displacement of greater than or equal to 10 liters per cylinder and less than 30 liters per comply with the emission standards in 40 CFR 94.8(a)(1).

(b) Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder that are not fire pump engines must com nonroad CI engines in §60.4202, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.

(c) Owners and operators of fire pump engines with a displacement of less than 30 liters per cylinder must comply with the emission standards in table 4 to this subpart, for all poll

(d) Owners and operators of emergency stationary CI engines with a displacement of greater than or equal to 30 liters per cylinder must meet the requirements in this section.

(1) For engines installed prior to January 1, 2012, limit the emissions of NOXin the stationary CI internal combustion engine exhaust to the following:
(i) 17.0 g/KW-hr (12.7 g/HP-hr) when maximum engine speed is less than 130 rpm;
(ii) 45 · n–0.2g/KW-hr (34 · n–0.2g/HP-hr) when maximum engine speed is 130 or more but less than 2,000 rpm, where n is maximum engine speed; and
(iii) 9.8 g/kW-hr (7.3 g/HP-hr) when maximum engine speed is 2,000 rpm or more.

(2) For engines installed on or after January 1, 2012, limit the emissions of NOXin the stationary CI internal combustion engine exhaust to the following:
(i) 14.4 g/KW-hr (10.7 g/HP-hr) when maximum engine speed is less than 130 rpm;
(ii) 44 · n–0.23g/KW-hr (33 · n–0.23g/HP-hr) when maximum engine speed is greater than or equal to 130 but less than 2,000 rpm and where n is maximum engine speed; and
(iii) 7.7 g/KW-hr (5.7 g/HP-hr) when maximum engine speed is greater than or equal to 2,000 rpm.

(3) Limit the emissions of PM in the stationary CI internal combustion engine exhaust to 0.40 g/KW-hr (0.30 g/HP-hr).

(e) Owners and operators of emergency stationary CI ICE with a displacement of less than 30 liters per cylinder who conduct performance tests in-use must meet the NTE standard

(f) Owners and operators of any modified or reconstructed emergency stationary CI ICE subject to this subpart must meet the emission standards applicable to the model year, ma modified or reconstructed CI ICE that are specified in paragraphs (a) through (e) of this section.

Table 3-2c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
Applicable Monitoring Requirements

§60.4209 What are the Monitoring Requirements if I am an Owner or Operator of a Stationary CI Internal Combustion Engine?
If you are an owner or operator, you must meet the monitoring requirements of this section. In addition, you must also meet the monitoring requirements specified in §60.4211.
(a) If you are an owner or operator of an emergency stationary CI internal combustion engine that does not meet the standards applicable to non-emergency engines, you must install a non-resetta
(b) If you are an owner or operator of a stationary CI internal combustion engine equipped with a diesel particulate filter to comply with the emission standards in §60.4204, the diesel particulate fil notifies the owner or operator when the high backpressure limit of the engine is approached.

Table 3-2c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
Testing Requirements

§ 60.4212 Testing Requirements for Owners and Operators
Owners and operators of stationary CI ICE with a displacement of less than 30 liters per cylinder who conduct performance tests pursuant to this subpart must do so according to paragraphs (a) through (e) of this section. (a) The performance test must be conducted according to the in-use testing procedures in 40 CFR part 1039, subpart F, for stationary CI ICE with a displacement of less than 10 liters per cylinder, and according to 40 CFR p of greater than or equal to 10 liters per cylinder and less than 30 liters per cylinder.
(b) Exhaust emissions from stationary CI ICE that are complying with the emission standards for new CI engines in 40 CFR part 1039 must not exceed the not-to-exceed (NTE) standards for the same 40 CFR 1039.101(e) and 40 CFR 1039.102(g)(1), except as specified in 40 CFR 1039.104(d). This requirement starts when NTE requirements take effect for nonroad diesel engines under 40 CFR part 1
(c) Exhaust emissions from stationary CI ICE that are complying with the emission standards for new CI engines in 40 CFR 89.112 or 40 CFR 94.8, as applicable, must not exceed the NTE numerical rec places as the applicable standard in 40 CFR 89.112 or 40 CFR 94.8, as applicable, determined from the following equation: Where: STD = The standard specified for that pollutant in 40 CFR 89.112 or 40 CFR 94.8, as applicable. Alternatively, stationary CI ICE that are complying with the emission standards for new CI engines in 40 CFR 89.112 or 40 CFR 94.8 may follow the testing procedures specified in §60.4213 of this sub
(d) Exhaust emissions from stationary CI ICE that are complying with the emission standards for pre-2007 model year engines in §60.4204(a), §60.4205(a), or §60.4205(c) must not exceed the NTE nu decimal places as the applicable standard in §60.4204(a), §60.4205(a), or §60.4205(c), determined from the equation in paragraph (c) of this section. Where: STD = The standard specified for that pollutant in §60.4204(a), §60.4205(a), or §60.4205(c). Alternatively, stationary CI ICE that are complying with the emission standards for pre-2007 model year engines in §60.4204(a), §60.4205(a), or §60.4205(c) may follow the testing procedures specifi
(e) Exhaust emissions from stationary CI ICE that are complying with the emission standards for new CI engines in 40 CFR part 1042 must not exceed the NTE standards for the same model year and 1042.101(c).

Notification, Reporting and Recordkeeping Requirements

§ 60.4214 What are my notification, reporting, and recordkeeping requirements if I am an owner or operator of a stationary CI internal combustion engine?

(a) Owners and operators of non-emergency stationary CI ICE that are greater than 2,237 KW (3,000 HP), or have a displacement of greater than or equal to 10 liters per cylinder, or are pre-2007 model year engines that are greater than 130 KV paragraphs (a)(1) and (2) of this section.

(1) Submit an initial notification as required in §60.7(a)(1). The notification must include the information in paragraphs (a)(1)(i) through (v) of this section.
(i) Name and address of the owner or operator;
(ii) The address of the affected source;
(iii) Engine information including make, model, engine family, serial number, model year, maximum engine power, and engine displacement;
(iv) Emission control equipment; and
(v) Fuel used.

(2) Keep records of the information in paragraphs (a)(2)(i) through (iv) of this section.
(i) All notifications submitted to comply with this subpart and all documentation supporting any notification.
(ii) Maintenance conducted on the engine.
(iii) If the stationary CI internal combustion is a certified engine, documentation from the manufacturer that the engine is certified to meet the emission standards.
(iv) If the stationary CI internal combustion is not a certified engine, documentation that the engine meets the emission standards.

(b) If the stationary CI internal combustion engine is an emergency stationary internal combustion engine, the owner or operator is not required to submit an initial notification. Starting with the model years in table 5 to th standards applicable to non-emergency engines in the applicable model year, the owner or operator must keep records of the operation of the engine in emergency and non-emergency service that are recorded through th of operation of the engine and the reason the engine was in operation during that time.

(c) If the stationary CI internal combustion engine is equipped with a diesel particulate filter, the owner or operator must keep records of any corrective action taken after the backpressure monitor has notified the owner c approached.

NSPS Subpart A - Applicable Notification and Recordkeeping Requirements

NSPS Subpart
40 CFR Part 60 Subpart A - General Provisions
Applicable Notification and Recordkeeping Requirements
§ 60.7 Notification and record keeping (a) Any owner or operator subject to the provisions of this part shall furnish the Administrator written notification or, if acceptable to both the Administrator and the owner or operator of a source, electro (1) A notification of the date **construction** (or reconstruction as defined under §60.15) of an affected facility is **commenced** postmarked no later than 30 days after such date. This requirement shall not app purchased in completed form. (3) A notification of the actual date of initial startup of an affected facility postmarked within 15 days after such date. (6) A notification of the anticipated date for conducting the opacity observations required by §60.11(e)(1) of this part. The notification shall also include, if appropriate, a request for the Administrator to pr performance test. The notification shall be postmarked not less than 30 days prior to such date. (b) Any owner or operator subject to the provisions of this part shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility; any m any periods during which a continuous monitoring system or monitoring device is inoperative. (c) Each owner or operator required to install a continuous monitoring device shall submit excess emissions and monitoring systems performance report (excess emissions are defined in applicable subpart of this section) to the Administrator semiannually, except when: more frequent reporting is specifically required by an applicable subpart; or the Administrator, on a case-by-case basis, determines that mo assess the compliance status of the source. All reports shall be postmarked by the 30th day following the end of each six-month period. Written reports of excess emissions shall include the following infor (1) The magnitude of excess emissions computed in accordance with §60.13(h), any conversion factor(s) used, and the date and time of commencement and completion of each time period of excess emiss reporting period. (2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the correc adopted. (3) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments. (4) When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report. (f) Any owner or operator subject to the provisions of this part shall maintain a file of all measurements, including **continuous monitoring system**, **monitoring device**, and performance testing measureme evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required by this par inspection. The **file shall be retained for at least two years** following the date of such measurements, maintenance, reports, and records.

Applicable Definition(s):

Affected facility means, with reference to a stationary source, any apparatus to which a standard is applicable (§60.2).

Commenced means, with respect to the definition of new source in section 111(a)(2) of the Act, that an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has e
complete, within a reasonable time, a continuous program of construction or modification (§60.2).

Construction means fabrication, erection, or installation of an affected facility (§60.2).

Continuous monitoring system means the total equipment, required under the emission monitoring sections in applicable subparts, used to sample and condition (if applicable), to analyze, and to provide a permanent record of

Monitoring device means the total equipment, required under the monitoring of operations sections in applicable subparts, used to measure and record (if applicable) process parameters (§60.2).

Table 3-2c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NSPS Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

NSPS Subpart A - Applicable Performance Testing Requirements

NSPS Subpart
40 CFR Part 60 Subpart A - General Provisions
Applicable Performance Testing Requirements
§ 60.8 Performance Tests (a) Except as specified in paragraphs (a)(1),(a)(2), (a)(3), and (a)(4) of this section, within 60 days after achieving the maximum production rate at which the **affected facility** will be operated, but not lat at such other times specified by this part, and at such other times as may be required by the Administrator under section 114 of the Act, the owner or operator of such facility shall conduct performan report of the results of such performance test(s). (b) Performance tests shall be conducted and data reduced in accordance with the test methods and procedures contained in each applicable subpart unless the Administrator (1) specifies or approves minor changes in methodology, (2) approves the use of an equivalent method, (3) approves the use of an alternative method the results of which he has determined to be adequate for indicating whet requirement for performance tests because the owner or operator of a source has demonstrated by other means to the Administrator's satisfaction that the **affected facility** is in compliance with the smaller sample volumes when necessitated by process variables or other factors. Nothing in this paragraph shall be construed to abrogate the Administrator's authority to require testing under sectior (c) Performance tests shall be conducted under such conditions as the Administrator shall specify to the plant operator based on representative performance of the **affected facility**. The owner or ope records as may be necessary to determine the conditions of the performance tests. Operations during periods of **startup**, **shutdown**, and **malfunction** shall not constitute representative conditions for in excess of the level of the applicable emission limit during periods of startup, shutdown, and malfunction be considered a violation of the applicable emission limit unless otherwise specified in the ap (d) The owner or operator of an **affected facility** shall provide the Administrator at least 30 days prior notice of any performance test, except as specified under other subparts, to afford the Administra after 30 days notice for an initially scheduled performance test, there is a delay (due to operational problems, etc.) in conducting the scheduled performance test, the owner or operator of an **affected** State or local agency) as soon as possible of any delay in the original test date, either by providing at least 7 days prior notice of the rescheduled date of the performance test, or by arranging a resche or local agency) by mutual agreement. (e) The owner or operator of an **affected facility** shall provide, or cause to be provided, performance testing facilities as follows: (1) Sampling ports adequate for test methods applicable to such facility. This includes (i) constructing the air pollution control system such that volumetric flow rates and pollutant emission rates can b and procedures and (ii) providing a stack or duct free of cyclonic flow during performance tests, as demonstrated by applicable test methods and procedures. (2) Safe sampling platform(s). (3) Safe access to sampling platform(s). (4) Utilities for sampling and testing equipment. (f) Unless otherwise specified in the applicable subpart, each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under For the purpose of determining compliance with an applicable standard, the arithmetic means of results of the three runs shall apply. In the event that a sample is accidentally lost or conditions occur because of forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances, beyond the owner or operator's control, compliance m using the arithmetic mean of the results of the two other runs.

Applicable Definition(s):

Affected facility means, with reference to a stationary source, any apparatus to which a standard is applicable (§60.2).

Malfunction means any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Failures that are caused in part b malfunctions (§60.2).

Shutdown means the cessation of operation of an affected facility for any purpose (§60.2).

Startup means the setting in operation of an affected facility for any purpose (§60.2).

Table 3-3A
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Applicable National Emission Standards for Hazardous Air Pollutants (NESHAPs)

Subpart	Promulgated NESHAP Standard (40 CFR Part 61)	Applicab
A	General Provisions	
B	Radon Emissions from Underground Uranium Mines	
C	Beryllium	
D	Beryllium Rocket Motor Firing	
E	Mercury	
F	Vinyl Chloride	
G	Reserved	
H	Radionuclides Other Than Radon From Department of Energy Facilities	
I	Radionuclides Emissions From Federal Facilities Other Than Nuclear Regulatory Commission Licensees and Not Covered by Subpart H	
J	Equipment Leaks (Fugitive Emission Sources) of Benzene	
K	Radionuclide Emissions from Elemental Phosphorus Plants	
L	Benzene Emissions From Coke By-Product Recovery Plants	
M	Asbestos	
N	Inorganic Arsenic Emissions From Glass Manufacturing Plants	
O	Inorganic Arsenic Emissions From Primary Copper Smelters	
P	Inorganic Arsenic Emissions From Arsenic Trioxide and Metallic Arsenic Production Facilities	
Q	Radon Emissions from Department of Energy Facilities	
R	Radon Emissions From Phosphogypsum Stacks	
S	Reserved	
T	Radon Emissions From the Disposal of Uranium Mill Tailings	
U	Reserved	
V	Equipment Leaks (Fugitive Emission Sources)	
W	Radon Emissions From Operating Mill Tailings	
X	Reserved	
Y	Benzene Emissions From Benzene Storage Vessels	
Z	Reserved	
AA	Reserved	
BB	Benzene Emissions From Benzene Transfer Operations	
CC	Reserved	
DD	Reserved	
EE	Reserved	
FF	Benzene Waste Operations	

Existing requirement applicable to the proposed silicon manufacturing facility.

Table 3-3B
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Applicable National Emission Standards for Hazardous Air Pollutants (NESHAPs) - MACT Source Categories

Subpart	Promulgated MACT Standard (40 CFR Part 63)	Appli
A	**General Provisions**	
B	Requirements for Control Technology Determinations for Major Sources in Accordance with Clean Air Act Section 112(g) and 112(j)	
C	List of Hazardous Air Pollutants, Petitions Process, Lesser Quantities Designations, Source Category List	
D	Regulations Governing Compliance Extensions for Early Reductions of HAPS	
E	Approval of State Programs and Delegation of Federal Authority	
F	Synthetic Organic Chemical Manufacturing Industry (SOCMI)	
G	SOCMI - Process Vents, Storage Vessels, Transfer Operations and Wastewater	
H	Equipment Leaks	
I	Certain Processes Subject to the Negotiated Regulation for Equipment Leaks	
J	Polyvinyl Chloride and Copolymers Production	
K	Reserved	
L	Coke Oven Batteries	
M	National Perchloroethylene Air Emissions Standards for Dry Cleaning Facilities	
N	Chromium Emissions from Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks	
O	Ethylene Oxide Emission Standards for Sterilization Facilities	
P	Reserved	
Q	Industrial Process Cooling Towers	
R	Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations	
S	Pulp and Paper Industry	
T	Halogenated Solvent Cleaning	
U	Group I Polymers and Resins	
V	Reserved	
W	Epoxy Resin Production and Non-Vinyl Polymides Production	
X	Secondary Lead Smelting	
Y	Marine Tank Vessel Loading Operations	
Z	Reserved	
AA	Phosphoric Acid Manufacturing Plants	
BB	Phosphate Fertilizers Production Plants	
CC	Petroleum Refineries	
DD	Off-Site Waste and Recovery Operations	
EE	Magnetic Tape Manufacturing Operations	
FF	Reserved	
GG	Aerospace Manufacturing and Rework Facilities	
HH	Oil and Natural Gas Production Facilitates	
II	Shipbuilding and Ship Repair (Surface Coatings)	
JJ	Wood Furniture Manufacturing Operations	
KK	Printing and Publishing Industry	
LL	Primary Aluminum Reduction Plants	
MM	Chemical Recovery Combustion Sources at Kraft, Soda, Sulfite, and Stand Alone Semi-chemical Pulp Mills	
OO	Tanks Level 1	
PP	Containers	
QQ	Surface Impoundments	
RR	Individual Drain Systems	
SS	Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or Process	
TT	Equipment Leaks - Control Level 1	
UU	Equipment Leaks - Control Level 2	

Table 3-3B
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Applicable National Emission Standards for Hazardous Air Pollutants (NESHAPs) - MACT Source Categories

Subpart	Promulgated MACT Standard (40 CFR Part 63)	Appl
VV	Oil-Water Separators and Organic-Water Separators	
WW	Storage Vessels (Tanks) - Control Level 2	
XX	Ethylene Manufacturing Process Units - Heat Exchange Systems and Waste Operations	
YY	Source Categories - Generic MACT	
ZZ - BBB	Reserved	
CCC	Steel Pickling - HCL Process Facilities and HCL Regeneration Plants	
DDD	Mineral Wool Production	
EEE	Hazardous Waste Combustors	
GGG	Pharmaceuticals Production	
HHH	Natural Gas Transmissions and Storage Facilities	
III	Flexible Polyurethane Foam Production	
JJJ	Group IV Polymers and Resins	
KKK	Reserved	
LLL	Portland Cement Manufacturing Industry	
MMM	Pesticide Active Ingredient Production	
NNN	Wool Fiberglass Manufacturing	
OOO	Manufacture of Amino/Phenolic Resins	
PPP	Polyether Polyols Production	
QQQ	Primary Copper Smelting	
RRR	Secondary Aluminum Production	
TTT	Primary Lead Smelting	
UUU	Petroleum Refineries - Catalytic Cracking Units, Catalytic Reformer Units, Sulfur Recovery Units	
VVV	Publically Owned Treatment Works (POTWs)	
WWW	Reserved	
XXX	Ferroalloys Production: Ferromanganese and Silomanganese	
AAAA	Municipal Solid Waste Landfills	
CCCC	Manufacturing of Nutritional Yeast	
DDDD	Plywood and Composite Wood Products	
EEEE	Organic Liquids Distribution (Non-Gasoline)	
FFFF	Miscellaneous Organic Chemical Manufacturing	
GGGG	Solvent Extraction for Vegetable Oil Production	
HHHH	Wet Formed Fiberglass Mat Production	
IIII	Surface Coating of Automobiles and Light Duty Trucks	
JJJJ	Paper and Other Web Coatings	
KKKK	Surface Coating of Metal Cans	
MMMM	Surface Coatings of Miscellaneous Metal Parts and Products	
NNNN	Surface Coating of Large Appliances	
OOOO	Printing, Coating and Dyeing of Fabrics and Other Textiles	
PPPP	Surface Coating of Plastic Parts and Products	
QQQQ	Surface Coating of Wood Building Products	
RRRR	Surface Coating of Metal Furniture	
SSSS	Surface Coating of Metal Coil	
TTTT	Leather Finishing Operations	
UUUU	Cellulose Products Manufacturing	
VVVV	Boat Manufacturing	
WWWW	Reinforced Plastics Composites Manufacturing	
XXXX	Rubber Tire Manufacturing	
YYYY	Stationary Combustion Turbines	
ZZZZ	**Stationary Reciprocating Internal Combustion Engines**	

Table 3-3B
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Applicable National Emission Standards for Hazardous Air Pollutants (NESHAPs) - MACT Source Categories

Subpart	Promulgated MACT Standard (40 CFR Part 63)	Appli
AAAAA	Lime Manufacturing	
BBBBB	Semiconductor Manufacturing	
CCCCC	Coke Ovens: Pushing, Quenching, and Battery Stacks	
DDDDD	Industrial, Commercial and Instructional Boilers and Process Heaters (Major Sources)	
EEEEE	Iron and Steel Foundries	
FFFFF	Integrated Iron and Steel Manufacturing Facilities	
GGGGG	Site Remediation	
HHHHH	Miscellaneous Coating Manufacturing	
IIIII	Mercury Emissions from Mercury Cell Chlor-Alkali Plants	
JJJJJ	Brick and Structural Clay Products Manufacturing	
KKKKK	Clay Ceramics Manufacturing	
LLLLL	Asphalt Processing and Asphalt Roofing Manufacturing	
MMMMM	Flexible Polyurethane Foam Fabrication Operations	
NNNNN	Hydrochloric Acid Production	
OOOOO	Reserved	
PPPPP	Engine Test Cells/Stands	
QQQQQ	Friction Materials Manufacturing Facilities	
RRRRR	Taconite Iron Ore Processing	
SSSSS	Refractory Products Manufacturing	
TTTTT	Primary Magnesium Refining	
UUUUU*	Coal- and Oil-Fired Electric Utility Steam Generating Units	
UUUUU - VVVVV	Reserved	
WWWWW	Hospital Ethylenne Oxide Sterilizers	
XXXXX	Reserved	
YYYYY	Area Sources: Electric Arc Furnace Steelmaking Facilities	
ZZZZZ	Iron and Steel Foundries Area Sources	
AAAAAA	Reserved	
BBBBBB	Gasoline Distribution Bulk Terminals, Bulk Plants, and Pipeline Facilities	
CCCCCC	Gasoline Dispensing Facilities	
DDDDDD	Polyvinyl Chloride and Copolymers Production Area Sources	
EEEEEE	Primary Copper Smelting Area Sources	
FFFFFF	Secondary Copper Smelting Area Sources	
GGGGGG	Primary Nonferrous Metals Area Sources - Zinc, Cadmium, and Beryllium	
HHHHHH	Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources	
IIIIII	Reserved	
JJJJJJ	Industrial, Commercial, and Institutional Boilers Area Sources	
KKKKKK	Reserved	
LLLLLL	Acrylic and Modacrylic Fibers Production Area Sources	
MMMMMM	Carbon Black Production Area Sources	
NNNNNN	Chemical Manufacturing Area Sources: Chromium Compounds	
OOOOOO	Flexible Polyurethane Foam Production and Fabrication Area Sources	
PPPPPP	Lead Acid Battery Manufacturing Area Sources	
QQQQQQ	Wood Preserving Area Sources	
RRRRRR	Clay Ceramics Manufacturing Area Sources	
SSSSSS	Glass Manufacturing Area Sources	
TTTTTT	Secondary Nonferrous Metals Processing Area Sources	
UUUUUU	Reserved	
VVVVVV	Chemical Manufacturing Area Sources	
WWWWWW	Area Source Standards for Plating and Polishing Operations	

Table 3-3B
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of Applicable National Emission Standards for Hazardous Air Pollutants (NESHAPs) - MACT Source Categories

Subpart	Promulgated MACT Standard (40 CFR Parts 63)	Applicable
XXXXXX	Area Source Standards for Nine Metal Fabrication and Finishing Source Categories	
YYYYYY	**Area Sources: Ferroalloys Production Facilities**	
ZZZZZZ	Area Source Standards for Aluminum, Copper, and Other Nonferrous Foundries	
AAAAAAA	Area Sources: Asphalt Processing and Asphalt Roofing Manufacturing	
BBBBBBB	Area Sources: Chemical Preparations Industry	
CCCCCCC	Area Sources: Paints and Allied Products Manufacturing	
DDDDDDD	Area Source Standards for Prepared Feeds Manufacturing	
EEEEEEE	Gold Mine Ore Processing and Production Area Source Category	

Notes:
*Subpart UUUUU - Coal- and Oil-Fired Electric Utility Steam Genrating Units is a proposed Subpart and has not yet been promulgated
Existing requirement applicable to the proposed silicon manufacturing facility.

Table 3-3c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NESHAP MACT Subpart ZZZZ - NESHAPS for Stationary Reciprocating Internal Combustion Engines
Applicability and Definitions

§ 63.6580 - What is the purpose of Subpart ZZZZ?

Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at
emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations.

§ 63.6585 - Am I Subject to this Subpart?

You are subject to this subpart if you own or operate a stationary RICE at a major or area source of HAP emissions.

(a) **A Stationary RICE** is any internal combustion engine which uses reciprocating motion to convert heat energy into mechanical work and which is not mobile.

(b) **A Major Source of HAP Emissions** is a plant site that emits or has the potential to emit any single HAP at a rate of 10 tons (9.07 mega grams) or more per year or any combination of HAP at are ate
or more per year, except that for oil and gas production facilities, a major source of HAP emissions is determined for each surface site.

(c) **An Area Source of HAP Emissions** is a source that is not a major source.

§ 63.6590 - What Parts of My Plant does this Subpart Cover?

(a) **Affected Source** is any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions, excluding stationary RICE being tested at a stationary RICE test cell/stand.

(2) **New Stationary RICE**
(i) A stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions is new if you commenced construction of the stationary RICE on or after December 19, 20(
(ii) A stationary RICE with a site rating of equal to or less than 500 brake HP located at a major source of HAP emissions is new if you commenced construction of the stationary RICE on or after June 12
(iii) A stationary RICE located at an area source of HAP emissions is new if you commenced construction of the stationary RICE after June 12, 2006.

(b) Stationary RICE Subject to Limited Requirements

(1) An **affected source** which meets either of the criteria in paragraphs (b)(1)(i) through (ii) of this section **does not have to meet the requirements of this subpart and of subpart A of this part excep**
requirements of 63.6645(f)

(i) The stationary RICE is a new or reconstructed emergency stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions.
(ii) The stationary RICE is a new or reconstructed limited use stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions.

(c) **Stationary RICE Subject to Regulations under 40 CFR 60 - An affected source that meets any of the criteria in paragraphs (c)(1) through (7) of this section must meet the requirements of this pa**
requirements of 40 CFR 60, Subpart IIII, for compression ignition engines or 40 CFR 60, Subpart JJJJ, for spark ignition engines. **No further requirements apply for such engines under this part.**

(1) A new or reconstructed stationary RICE located at an area source.
(2) A new or reconstructed 2SLB stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions.
(3) A new or reconstructed 4SLB stationary RICE with a site rating of less than 250 brake HP located at a major source of HAP emissions.
(4) A new or reconstructed spark ignition 4 stroke rich burn (4SRB) stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions.
(5) A new or reconstructed stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions which combusts landfill or digester gas equivalent to 10 p
heat input on an annual basis.
(6) A new or reconstructed emergency or limited use stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions.
(7) A new or reconstructed compression ignition (CI) stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions.

§ 63.6595 - When do I have to Comply with this Subpart?

(a)(3) If you start up your new or reconstructed stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions after August 6, 2004, you must comply with the
limitations and operating limitations in this subpart upon startup of your affected source.

(5) If you start up your new or reconstructed stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions after January 18, 2008, you must compl
limitations and operating limitations in this subpart upon startup of your affected source.

63.6645 - What Notifications Must I Submit and When?
(f) If you are required to submit an Initial Notification but are otherwise not affected by the requirements of this subpart, in accordance with 63.6590(b), your notification should include the information in 63.9(b)(2)(i) thr additional requirements and explain the basis of the exclusion (for example, that it operates exclusively as an emergency stationary RICE if it has a site rating of m roe than 500 brake HP located at a major source of HAP e

63.9 - Notification Requirements
(b) Initial notifications. (1)(i) The requirements of this paragraph apply to the owner or operator of an affected source when such source becomes subject to a relevant standard.
(ii) If an area source that otherwise would be subject to an emission standard or other requirement established under this part if it were a major source subsequently increases its emissions of hazardous air pollutants (or source is a major source that is subject to the emission standard or other requirement, such source shall be subject to the notification requirements of this section.
(iii) Affected sources that are required under this paragraph to submit an initial notification may use the application for approval of construction or reconstruction under §63.5(d) of this subpart, if relevant, to fulfill the init
(2) The owner or operator of an affected source that has an initial startup before the effective date of a relevant standard under this part shall notify the Administrator in writing that the source is subject to the relevant st than 120 calendar days after the effective date of the relevant standard (or within 120 calendar days after the source becomes subject to the relevant standard), shall provide the following information:
(i) The name and address of the owner or operator;
(ii) The address (i.e., physical location) of the affected source;
(iii) An identification of the relevant standard, or other requirement, that is the basis of the notification and the source's compliance date;
(iv) A brief description of the nature, size, design, and method of operation of the source and an identification of the types of emission points within the affected source subject to the relevant standard and types of hazar
(v) A statement of whether the affected source is a major source or an area source.

Table 3-3c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
NESHAP MACT Subpart ZZZZ - NESHAPS for Stationary Reciprocating Internal Combustion Engines
Applicability and Definitions

§ 63.6580 - What is the purpose of Subpart ZZZZ?

Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations.

§ 63.6585 - Am I Subject to this Subpart?

You are subject to this subpart if you own or operate a stationary RICE at a major or area source of HAP emissions.

(a) **A Stationary RICE** is any internal combustion engine which uses reciprocating motion to convert heat energy into mechanical work and which is not mobile.

(b) **A Major Source of HAP Emissions** is a plant site that emits or has the potential to emit any single HAP at a rate of 10 tons (9.07 mega grams) or more per year or any combination of HAP at are ate or more per year, except that for oil and gas production facilities, a major source of HAP emissions is determined for each surface site.

(c) **An Area Source of HAP Emissions** is a source that is not a major source.

§ 63.6590 - What Parts of My Plant does this Subpart Cover?

(a) **Affected Source** is any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions, excluding stationary RICE being tested at a stationary RICE test cell/stand.

(2) **New Stationary RICE**
(i) A stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions is new if you commenced construction of the stationary RICE on or after December 19, 20(
(ii) A stationary RICE with a site rating of equal to or less than 500 brake HP located at a major source of HAP emissions is new if you commenced construction of the stationary RICE on or after June 12
(iii) A stationary RICE located at an area source of HAP emissions is new if you commenced construction of the stationary RICE after June 12, 2006.

(b) Stationary RICE Subject to Limited Requirements

(1) An **affected source** which meets either of the criteria in paragraphs (b)(1)(i) through (ii) of this section **does not have to meet the requirements of this subpart and of subpart A of this part excep requirements of 63.6645(f)**

(i) The stationary RICE is a new or reconstructed emergency stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions.
(ii) The stationary RICE is a new or reconstructed limited use stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions.

(c) **Stationary RICE Subject to Regulations under 40 CFR 60 - An affected source that meets any of the criteria in paragraphs (c)(1) through (7) of this section must meet the requirements of this pa requirements of 40 CFR 60, Subpart IIII, for compression ignition engines** or 40 CFR 60, Subpart JJJJ, for spark ignition engines. **No further requirements apply for such engines under this part.**

(1) A new or reconstructed stationary RICE located at an area source.
(2) A new or reconstructed 2SLB stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions.
(3) A new or reconstructed 4SLB stationary RICE with a site rating of less than 250 brake HP located at a major source of HAP emissions.
(4) A new or reconstructed spark ignition 4 stroke rich burn (4SRB) stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions.
(5) A new or reconstructed stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions which combusts landfill or digester gas equivalent to 10 p heat input on an annual basis.
(6) A new or reconstructed emergency or limited use stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions.
(7) A new or reconstructed compression ignition (CI) stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions.

§ 63.6595 - When do I have to Comply with this Subpart?

(a)(3) If you start up your new or reconstructed stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions after August 6, 2004, you must comply with the limitations and operating limitations in this subpart upon startup of your affected source.

(5) If you start up your new or reconstructed stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions after January 18, 2008, you must compl limitations and operating limitations in this subpart upon startup of your affected source.

63.6645 - What Notifications Must I Submit and When?
(f) If you are required to submit an Initial Notification but are otherwise not affected by the requirements of this subpart, in accordance with 63.6590(b), your notification should include the information in 63.9(b)(2)(i) thr additional requirements and explain the basis of the exclusion (for example, that it operates exclusively as an emergency stationary RICE if it has a site rating of m roe than 500 brake HP located at a major source of HAP e

63.9 - Notification Requirements

(b) Initial notifications. (1)(i) The requirements of this paragraph apply to the owner or operator of an affected source when such source becomes subject to a relevant standard.

(ii) If an area source that otherwise would be subject to an emission standard or other requirement established under this part if it were a major source subsequently increases its emissions of hazardous air pollutants (or source is a major source that is subject to the emission standard or other requirement, such source shall be subject to the notification requirements of this section.

(iii) Affected sources that are required under this paragraph to submit an initial notification may use the application for approval of construction or reconstruction under §63.5(d) of this subpart, if relevant, to fulfill the init

(2) The owner or operator of an affected source that has an initial startup before the effective date of a relevant standard under this part shall notify the Administrator in writing that the source is subject to the relevant st than 120 calendar days after the effective date of the relevant standard (or within 120 calendar days after the source becomes subject to the relevant standard), shall provide the following information:

(i) The name and address of the owner or operator;

(ii) The address (i.e., physical location) of the affected source;

(iii) An identification of the relevant standard, or other requirement, that is the basis of the notification and the source's compliance date;

(iv) A brief description of the nature, size, design, and method of operation of the source and an identification of the types of emission points within the affected source subject to the relevant standard and types of hazar

(v) A statement of whether the affected source is a major source or an area source.

Table 3-3d
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
MACT Subpart YYYYYY - NESHAPS for Area Sources: Ferroalloys Production Facilities
Applicability, Compliance and Definitions

§ 63.11524 Am I Subject to this Subpart?

(a) You are subject to this subpart if you **own or operate a ferroalloys production facility that is an area source of hazardous air pollutant (HAP) emissions. A ferroalloys producti** ferrosilicon, ferrotitanium using the aluminum reduction process, ferrovanadium, ferromolybdenum, calcium silicon, silicomanganese zirconium, ferrochrome silicon, silvery iron, h standard ferromanganese, silicomanganese, ferromanganese silicon, calcium carbide or other ferroalloy products using electrometallurgical operations including electric arc furnac

(b) The provisions of this subpart apply to each existing and new electrometallurgical operation affected source as defined in paragraphs (b)(1) and (b)(2) of this section.

(1) An electrometallurgical operation affected source is existing if you commenced construction or reconstruction of the EAF or other reaction vessel on or before September 15, 2

(2) An **electrometallurgical operation affected source is new if you commenced construction or reconstruction of the EAF or other reaction vessel after September 15, 2008.**

§ 63.11525 What are My Compliance Dates?

(c) If you start up a **new affected source after December 23, 2008**, you must **achieve compliance** with the applicable provisions of this subpart **upon startup of your affected sour**

§ 63.11532 What Definitions Apply to this Subpart?

Capture system means the collection of components used to capture gases and fumes released from one or more emissions points and then convey the captured gas stream to a c system may include but is not limited to, the following components as applicable to a give capture system design: duct intake devices, hoods, enclosures, ductwork, dampers, man

Control device means the air pollution control equipment used to remove PM from the effluent gas stream generated by an EAF furnace or other reaction vessel.

Electric arc furnace means any furnace wherein electrical energy is converted to heat energy by transmission of current between electrodes partially submerged in the furnace cha

Electrometallurgical operations means the use of electric and electrolytic processes to purify metals or reduce metallic compounds to metals.

Table 3-3d
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
MACT Subpart YYYYYY - NESHAPS for Area Sources: Ferroalloys Production Facilities
Standards for Visible Emissions and Opacity

Pollutant
Visible Emissions and Opacity
§ 63.11526 What are the Standards for New and Existing Ferroalloys Production Facilities
(a) You must not discharge to the atmosphere **visible emissions (VE) from the control device that exceed 5 percent of accumulated occurrences in a 60-minute observation peric**
(b) You must not discharge to the atmosphere **fugitive PM emissions from the furnace building containing the electrometallurgical operations that exhibit opacity greater than 2 minute average per hour that does not exceed 60 percent.**

§ 63.11527 What are the Monitoring Requirements for New and Existing Sources?

(a) **EAF equipped with fabric filters** —(1) Visual monitoring. You must **conduct visual monitoring of the monovent or fabric filter outlet stack(s) for any VE** according to the schedule specified in paragraphs (a)(1)(i) an

(i) **Daily visual monitoring.** Perform visual determination of fugitive emissions once per day, on each day the process is in operation, during operation of the process.

(ii) **Weekly visual monitoring.** If no visible fugitive emissions are detected in consecutive daily visual monitoring performed in accordance with paragraph (a)(1)(i) of this section for 90 days of operation of the process, visual monitoring to once per calendar week of time the process is in operation, during operation of the process. If visible fugitive emissions are detected during these inspections, you must resume daily visual monitor that the process is in operation, in accordance with paragraph (a)(1)(i) of this section until you satisfy the criteria of this section to resume conducting weekly visual monitoring.

(2) If the visual monitoring reveals the presence of any VE, you must conduct a Method 22 (appendix A–7 of 40 CFR part 60) test following the requirements of §63.11528(b)(1) within 24 hours of determining the prese

(3) If you own or operate an existing affected source, you may install, operate, and maintain a bag leak detection system for each fabric filter as an alternative to the monitoring requirements in paragraph (a)(1) of this affected source, you **must install, operate, and maintain a bag leak detection system for each fabric filter** according to the requirements in paragraphs (a)(3)(i) through (a)(3)(vii) of this section. Such source is not subj (a)(1) and (a)(2) of this section.

(i) The system must be **certified by the manufacturer to be capable of detecting emissions of PM at concentrations of 10 milligrams per actual cubic meter (0.00044 grains per actual cubic foot) or less.**

(ii) The **bag leak detection system sensor must provide output of relative PM loadings** and the owner or operator shall **continuously record the output** from the bag leak detection system using a strip chart recorder,

(iii) The system must be **equipped with an alarm** that will sound when an increase in relative PM loadings is detected over the alarm set point established in the operation and maintenance plan, and the alarm must be seen, or otherwise detected by the appropriate plant personnel.

(iv) The initial adjustment of the system must, at minimum, consist of establishing the baseline output by adjusting the sensitivity (range) and the averaging period of the device, and establishing the alarm set points. If delay time feature, you also must establish a maximum reasonable alarm delay time.

(v) Following the initial adjustment, do not adjust the sensitivity or range, averaging period, alarm set point, or alarm delay time, except that, once per quarter, you may adjust the sensitivity of the bag leak detection sy including temperature and humidity.

(vi) For fabric filters that are discharged to the atmosphere through a stack, the **bag leak detector sensor must be installed downstream of the fabric filter and upstream of any wet scrubber.**

(vii) Where multiple detectors are required, the system's instrumentation and alarm may be shared among detectors.

(4) When operating a bag leak detection system, if an alarm sounds, conduct visual monitoring of the monovent or fabric filter outlet stack(s) as required in paragraph (a)(1) of this section within 1 hour. If the visual monitoring reveals the prese Method 22 test following the requirements of §63.11528(b)(1) within 24 hours of determining the presence of any VE.

(5) You must prepare a **site-specific monitoring plan for each bag leak detection system**. You must operate and maintain each bag leak detection system according to the plan at all times. Each plan must address all of the items identified in pa section.

(i) Installation of the bag leak detection system.

(ii) Initial and periodic adjustment of the bag leak detection system including how the alarm set-point and alarm delay time will be established.

(iii) Operation of the bag leak detection system including quality assurance procedures.

(iv) Maintenance of the bag leak detection system including a routine maintenance schedule and spare parts inventory list.

(v) How the bag leak detection system output will be recorded and stored.

(b) **EAF equipped with wet scrubbers** —(1) Visual monitoring. You must **conduct visual monitoring of the wet scrubber outlet stack(s) for any VE** according to the schedule specified in paragraphs (b)(1)(i) and (b)(1)(ii) of this section.

(i) **Daily visual monitoring.** Perform visual determination of fugitive emissions once per day, on each day the process is in operation, during operation of the process.

(ii) **Weekly visual monitoring.** If no visible fugitive emissions are detected in consecutive daily visual monitoring performed in accordance with paragraph (b)(1)(i) of this section for 90 days of operation of the process, you may decrease the free calendar week of time the process is in operation, during operation of the process. If visible fugitive emissions are detected during these inspections, you must resume daily visual monitoring of that operation during each day that the process i paragraph (b)(1)(i) of this section until you satisfy the criteria of this section to resume conducting weekly visual monitoring.

(2) If the visual monitoring reveals the presence of any VE, you must conduct a Method 22 (appendix A–7 of 40 CFR part 60) test following the requirements of §63.11528(b)(1) within 24 hours of determining the presence of any VE.

(3) If you own or operate an existing affected source, you may install, operate and maintain a continuous parameter monitoring system (CPMS) to measure and record the 3-hour average pressure drop and scrubber water flow rate as an alter specified in paragraph (b)(1) of this section. If you own or operate a **new sealed EAF affected source, you must install, operate, and maintain a CPMS for each wet scrubber.** Such source is not subject to the requirements in paragraph (b)(1) o

(4) When operating a CPMS, if the 3-hour average pressure drop or scrubber water flow rate is below the minimum levels that indicate normal operation of the control device, conduct visual monitoring of the outlet stack(s) as required by para of determining that the 3-hour average parameter value is below the required minimum levels. Manufacturer's specifications for pressure drop and liquid flow rate will be used to determine normal operations. If the visual monitoring reveals t a Method 22 (appendix A–7 of 40 CFR part 60) test following the requirements of §63.11528(b)(1) within 24 hours of determining the presence of any VE.

Table 3-3d
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
MACT Subpart YYYYYY - NESHAPS for Area Sources: Ferroalloys Production Facilities
Applicable Testing and Compliance Requirements

§ 63.11528 What are the Performance Test and Compliance Requirements for New and Existing Sources?

(a) **Initial compliance demonstration deadlines.** You must conduct an initial Method 22 (appendix A–7 of 40 CFR part 60) test following the requirements of paragraph (b)(1) of this section of each existing electrometallur **observation** following the requirements of paragraph (c)(1) of this section from the **furnace building due to electrometallurgical operations no later than 60 days after your applicable compliance date.** For any **new ele conduct an initial Method 22 test** following the requirements of paragraph (b)(1) of this section **within 15 days of startup of the control device.**

(b) **Visible emissions limit compliance demonstration.**

(1) You must **conduct a Method 22** (appendix A–7 of 40 CFR part 60) test to **determine that VE from the control device** do not exceed the emission standard specified in §63.11526(a). For a fabric filter, conduct the test f stack(s), as applicable. For a wet scrubber, conduct the test for at least 60 minutes at the outlet stack(s).

(2) You must **conduct a semiannual Method 22 test** using the procedures specified in paragraph (b)(1) of this section.

(c) **Furnace building opacity**. (1) You must conduct an **opacity test for fugitive emissions from the furnace building** according to the procedures in §63.6(h) and **Method 9** (appendix A–4 of 40 CFR part 60). The test must the furnace or reaction vessel. The observation must be focused on the part of the building where electrometallurgical operation fugitive emissions are most likely to be observed.

(2) **Conduct subsequent Method 9 tests no less frequently than every 6 months** and each time you make a process change likely to increase fugitive emissions.

(3) **After the initial Method 9 performance test, as an alternative to the Method 9 performance test, you may monitor VE using Method 22 (appendix A–7 of 40 CFR part 60) for subsequent semi-annual compliance d** observed for 90 percent of the readings over the furnace cycle (tap to tap) or 60 minutes, whichever is longer. If VE are observed greater than 10 percent of the time over the furnace cycle or 60 minutes, whichever is long possible, but no later than 15 calendar days after the Method 22 test using Method 9 (appendix A–4 of 40 CFR part 60) as specified in paragraph (c)(1) of this section.

Table 3-3d
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
MACT Subpart YYYYYY - NESHAPS for Area Sources: Ferroalloys Production Facilities
Applicable Notification, Reporting and Recordkeeping

§ 63.11529 What are the Notification, Reporting, and Recordkeeping Requirements?

Notifications

(a) **Initial notification.** You must submit the Initial Notification required by §63.9(b)(2) of the General Provisions **no later than 120 days after the date of publication of this final rule** in theFederal Register.The Initial Notificatio through (b)(2)(iv).

(b) **Notification of compliance status**. You must submit a Notification of Compliance Status in accordance with §63.9(h) of the General Provisions **before the close of business on the 30th day following the completion of the i** include the following:

(1) The results of Method 22 (appendix A–7 of 40 CFR part 60) test for VE as required by §63.11528(a);

(2) If you have installed a bag leak detection system, documentation that the system satisfies the design requirements specified in §63.11527(a)(3) and that you have prepared a site-specific monitoring plan that meets the req

(3) The results of the Method 9 (appendix A–4 of 40 CFR part 60) test for building opacity as required by §63.11528(a).

Reporting

(c) **Annual compliance certification**. If you own or operate an affected source, you must submit an annual certification of compliance according to paragraphs (c)(1) through (c)(4) of this section.

(1) The results of any daily or weekly visual monitoring events required by §63.11527(a)(1) and (b)(1), alarm-based visual monitoring at sources equipped with bag leak detection systems as required by §63.11527(a)(4), or reac on wet scrubbers required by §63.11527(b)(4).

(2) The results of the follow up Method 22 (appendix A–7 of 40 CFR part 60) tests that are required if VE are observed during the daily or weekly visual monitoring, alarm-based visual monitoring, or out-of-range operating read

(3) The results of the Method 22 (appendix A–7 of 40 CFR part 60) or Method 9 (appendix A–4 of 40 CFR part 60) tests required by §63.11528(b) and (c), respectively.

(4) If you operate a bag leak detection system for a fabric filter or a CPMS for a wet scrubber, submit annual reports according to the requirements in §63.10(e) and include summary information on the number, duration, and c downtime incidents (other than downtime associated with zero and span or other calibration checks, if applicable).

Recordkeeping

(d) You must keep the records specified in paragraphs (d)(1) through (d)(2) of this section.

(1) As required in §63.10(b)(2)(xiv), you must keep a **copy of each notification that you submitted** to comply with this subpart and **all documentation supporting any Initial Notification, Notification of Compliance Status, an**

(2) You must keep the records of **all daily or weekly visual, Method 22** (appendix A–7 of 40 CFR part 60), and **Method 9** (appendix A–4 of 40 CFR part 60) **monitoring data** required by §63.11527 and the information identified i

(i) The date, place, and time of the monitoring event;

(ii) Person conducting the monitoring;

(iii) Technique or method used;

(iv) Operating conditions during the activity; and

(v) Results, including the date, time, and duration of the period from the time the monitoring indicated a problem (e.g., VE) to the time that monitoring indicated proper operation.

(e) Your records must be in a form suitable and readily available for expeditious review, according to §63.10(b)(1).

(f) As specified in §63.10(b)(1), you must **keep each record for 5 years following the date of each recorded action.**

(g) You must **keep each record onsite for at least 2 years after the date of each recorded** action according to §63.10(b)(1). You **may keep the records offsite for the remaining 3 years.**

Table 3-4A

Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Applicable and Non-Applicable State Air Pollution Regulations

APC-S-1 **Air Emission Regulations for the Prevention, Abatement and Control of Air Contaminants**

Section 1.	**General**
Section 2.	**Definitions**
Section 3.	**Specific Criteria for Sources of Particulate Matter**
Section 4.	**Specific Criteria for Sources of Sulfur Compounds**
Section 5.	**Specific Criteria for Sources of Chemical Emissions**
Section 6.	**New Sources**
Section 7.	**Exceptions**
Section 8.	**Provisions for Hazardous Air Pollutants**
Section 9.	**Stack Height Considerations**
Section 10.	**Provisions for Upsets, Startups and Shutdowns**
Section 11.	**Severability**
Section 12.	**Provisions for Existing Hospital/Medical/Infectious Waste Incinerators**
Section 13.	**Provisions for Existing Commercial and Industrial Solid Waste Incineration Units**
Section 14.	**Provisions for the Clean Air Interstate Rule**

APC-S-2 **Permit Regulations for the Construction and/or Operation of Air Emissions Equipment**

I	**General Requirements (Subpart D "Permitting Requirements")**
II	**General Standards Applicable to All Permits**
III	**Application for Permit to Construct and State Permit to Operate New Stationary Source**
IV	**Public Participation and Public Availability of Information**
V	**Application Review**
VI	**Compliance Testing**
VII	**Emissions Evaluation Report**
VIII	**Procedures on Renewal of State Permit to Operate**
IX	**Reporting and Recordkeeping**
X	**Emission Reduction Schedule**
XI	**General Permits**
XII	**Multi-Media Permits**
XIII	**Exclusions**

Table 3-4A

Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Applicable and Non-Applicable State Air Pollution Regulations

XIV	**CAFOs**
XV	**Options**
XVI	**Permit Transfer**
XVII	**Severability**

APC-S-3 **Mississippi Regulations for the Prevention of Air Pollution Emergency Episodes**

Section 1.	**General**
Section 2.	**Definitions**
Section 3.	**Episode Criteria**
Section 4.	**Emission Control Action Programs**
Section 5.	**Emergency Orders**
APC-S-3	**Mississippi Regulations for the Prevention of Air Pollution Emergency Episodes**

APC-S-4 **Mississippi Ambient Air Quality Standards**

	Mississippi Ambient Air Quality Standards

APC-S-5 **Mississippi Regulations for the Prevention of Significant Deterioration of Air Quality**

	Mississippi Regulations for the Prevention of Significant Deterioration of Air Quality

APC-S-6 **Air Emissions Operating Permit Regulations for the Purposes of Title IV of the Federal Clean Air Act**

I	**General Requirements**
II	**Permit Applications**
III	**Permit Content**
IV	**Permit Issuance(s), Renewal(s), Reopening(s) and Revision(s)**
V	**Permit Review by EPA and Affected State(s)**
VI	**Permit Fees**
VII	**Insignificant Activities and Emissions**

APC-S-7 **Acid Rain Program Permit Regulations for Purposes of Title IV of the Federal Clean Air Act**

	Acid Rain Program Permit Regulations for Purposes of Title IV of the Federal Clean Air Act

Table 3-4A

Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Applicable and Non-Applicable State Air Pollution Regulations

APC-S-8 Air Toxics Regulations

I	**Requirements for Control Technology Determination for Major Sources in Accordance with Clean Air Act Section 112(g)**
II	**Chemical Accident Prevention Provisions**

APC-S-9 Regulations for Lead-Based Paint Activities

	General Scope and Applicability
	Definitions
Chapter 1.	**Accreditation of Training Programs**
Chapter 2.	**Certification of Individuals and Firms Engaged in Lead-Based Paint Activities**
Chapter 3.	**Work Practice Standards for Conducting Lead-Based Paint Activities**
Chapter 4.	**Compliance Monitoring and Enforcement**

APC-S-10 Regulations for Accreditation and Certification of Asbestos Abatement Personnel

	Regulations for Accreditation and Certification of Asbestos Abatement Personnel

Notes:

Shaded items identify those State air regulations that contain emission standards or limits, monitoring or testing requirements, or other relevant requirements that are intended to protect human health and welfare and have been determined to be applicable to MS Silicon's proposed silicon manufacturing facility in Burnsville, Mississippi. Refer to discussion on applicability and compliance in Section 3 of this application.

Non-shaded regulations have been determined to be not applicable (do not contain any specific emission limitations, monitoring, recordkeeping, testing or reporting requirements) to MS Silicon's proposed silicon manufacturing facility in Burnsville, Mississippi.

Pollutant

Particulate Matter (PM)

1. Smoke

(a) No person shall cause, permit, or allow the emission of smoke from a point source into the open air from any manufacturing, industrial, commercial or waste disposal process whi to the exceptions provided in (b) & (c).

(b) Startup operations may produce emissions which exceed 40% opacity for up to fifteen (15) minutes per startup in any one hour and not to exceed three (3) startups per stack in a

2. Equivalent Opacity

Equivalent Opacity. No person shall cause, allow, or permit the discharge into the ambient air from any point source or emissions, any air contaminant of such opacity as to obscure a 40% opacity, equivalent to that provided in Section 3.1(a). This shall not apply to vision obscuration caused by uncombined water droplets.

3. General Nuisances

General Nuisances. No person shall cause, permit, or allow the emission of particles, or any contaminants in sufficient amounts or of such duration from any process as to be injuriou to be a public nuisance, or create a condition of air pollution.

(a) No person shall cause or permit the handling or transporting or storage of any material in a manner which allows or may allow unnecessary amounts of particulate matter to becc

(b) When dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof escape from a building or equipment in such a manner and amount as to cause a nuisance to originated or to violate any other provision of this regulation, the Commission may order such corrected in a way that all air and gases or air and gasborne material leaving the building or equipment are controlled or removed prior to discharge to the open air.

4. Fuel Burning

(a) Fossil Fuel Burning. The maximum permissible emission of ash and/or particulate matter from fossil fuel burning installations shall be limited as follows:

(1) Emissions from installations of less than 10 million BTU per hour heat input shall not exceed 0.6 pounds per million BTU per hour heat input.

(2) Emissions from installations equal to or greater than 10 million BTU per hour heat input but less than 10,000 million BTU per hour heat input shall not exceed an emission rate as

$E = 0.8808 * I^{-0.1667}$

where E is the emission rate in pounds per million BTU per hour heat input and I is the heat input in millions of BTU per hour.

(3) Emissions from installations equal to or greater than 10,000 million BTU per hour heat input shall not exceed 0.19 pounds per million BTU per hour heat input.

6. Manufacturing Process

(a) General. Except as otherwise specified, no person shall cause, permit, or allow the emission of particulate matter in total quantities in any one hour from any manufacturing proc vents, outlets, or combination thereof, to exceed the amount determined by the relationship

$E = 4.1\ p^{0.67}$

where E is the emission rate in pounds per hour and p is the process weight input rate in tons per hour.

Conveyor discharge of coarse solid matter may be allowed if no nuisance is created beyond the property boundary where the discharge occurs.

Table 3-4c
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
APC-S-1 - Section 4. Specific Criteria for Sources of Sulfur Compounds

Pollutant
Sulfur Compounds (SO_2)
1. Sulfur Dioxide Emissions from Fuel Burning
(a) The maximum discharge of sulfur oxides from any fuel burning installation in which the fuel is burned primarily to produce heat or power by indirect heat transfer shall not exce million BTU heat input. (b) No person shall cause or permit the burning of fuel in any fuel burning equipment that results in an average emission of sulfur dioxide from any calendar year at a rate greater t for the corresponding calendar year 1970 unless otherwise authorized by the Commission. Installations under construction on January 25, 1972, are excluded from this requirement. (c) The maximum discharge of sulfur dioxide from any modified fuel burning unit whose generation capacity is less than 250 million BTU per hour and in which the fuel is burned pr heat transfer shall not exceed 2.4 pounds (measured as sulfur dioxide) per million BTU heat input. For the purposes of Section 4 of these regulations only, "modification" shall mea Source which increases the amount of any air pollutant (to which a standard applies) emitted by such source or which results in the emission of any air pollutant (to which a standa
2. Sulfur Dioxide Emissions from Processes
(a) Except as otherwise provided herein, no person shall cause or permit the emission of gas containing sulfur oxides (measured as sulfur dioxide) in excess of 2,000 ppm (volume) January 25, 1972, or in excess of 500 ppm (volume) from any process equipment constructed after January 25, 1972. The 500 ppm (volume) requirement shall apply for equipment otherwise provided by the Commission.

Table 3-5a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of 28 Designated Source Categories for PSD Permitting

PSD Listed Source Category	PSD Tons/Year Threshold*	Applicable to the Proposed C Project?**
Fossil Fuel-Fired Steam Electric Plants of More Than 250 Million Btu/hr Heat Input	100	No
Coal Cleaning Plants (with Thermal Dryers)	100	No
Kraft Pulp Mills	100	No
Portland Cement Plants	100	No
Primary Zinc Smelters	100	No
Iron and Steel Mill Plants	100	No
Primary Aluminum Ore Reduction Plants	100	No
Primary Copper Smelters	100	No
Municipal Incinerators Capable of Charging More Than 250 Tons of Refuse Per Day	100	No
Hydrofluoric Acid Plants	100	No
Sulfuric Acid Plants	100	No
Nitric Acid Plants	100	No
Petroleum Refineries	100	No
Lime Plants	100	No
Phosphate Rock Processing Plants	100	No
Coke Oven Batteries	100	No
Sulfur Recovery Plants	100	No
Carbon Black Plants	100	No
Primary Lead Smelters	100	No
Fuel Conversion Plants	100	No
Sintering Plants	100	No
Secondary Metal Production Plants	100	No
Chemical Process Plants	100	No
Fossil Fuel Boilers (or Combinations Thereof) Totaling More Than 250 Million Btu/hr Heat Input	100	No
Petroleum Storage and Transfer Units with a Total Storage Capacity Exceeding 300,000 Barrels	100	No
Taconite Ore Processing Plants	100	No
Glass Fiber Processing Plants	100	No
Charcoal Production Plants	100	No

*Please be aware that any other source which has the potential to emit 250 tons per year of any regulated pollutar to PSD major source regulations regardless of the sources manufacturing operations.

**The proposed MS Silicon silicon manufacturing plant is not one of the 28 designated source categories thus is sul 250 tons/year PSD applicability threshold.

Table 3-5b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
PSD Significant Emission Rates

Pollutant	PSD Significant Emission Rates (tons/year)
Carbon Monoxide (CO)	100
Nitrogen Dioxide (NO_x)	40
Particulate Matter (PM)	25
Particulate Matter (PM_{10})	15
Particulate Matter ($PM_{2.5}$)	10
Volatile Organic Compounds (VOC)	40
Sulfur Dioxide (SO_2)	40
Lead	0.6
Fluorides	3
Sulfuric Acid Mist	7
Hydrogen Sulfide (H_2S)	10
Total Reduced Sulfur (Including H_2S)	10
Reduced Sulfur Compounds (Including H_2S)	10
Greenhouse Gases (GHG)	CO_2e - 75,000

Table 3-6
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 µg/m^3 [2]	Rolling 3-Month Average	Same as Primary	
Nitrogen Dioxide	53 ppb [3]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [4]	None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour [5]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual [6] (Arithmetic Average)	Same as Primary	
	35 µg/m^3	24-hour [7]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [8]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [9]	Same as Primary	
	0.12 ppm	1-hour [10]	Same as Primary	
Sulfur Dioxide	0.03 ppm [11] (1971 std)	Annual (Arithmetic Average)	0.5 ppm	3-hour [1]
	0.14 ppm [11] (1971 std)	24-hour [1]		
	75 ppb [12]	1-hour	None	

(1) Not to be exceeded more than once per year.

(2)Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

(5) Not to be exceeded more than once per year on average over 3 years.

(6) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008).

(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

(c) EPA is in the process of reconsidering these standards (set in March 2008).

(10) (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1.

(11) The 1971 sulfur dioxide standards remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

(12) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

Table 3-7
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Federally Regulated Hazardous Air Pollutants

CAS Number	Chemical Name
75070	Acetaldehyde
60355	Acetamide
75058	Acetonitrile
98862	Acetophenone
53963	2-Acetylaminofluorene
107028	Acrolein
79061	Acrylamide
79107	Acrylic acid
107131	Acrylonitrile
107051	Allyl chloride
92671	4-Aminobiphenyl
62533	Aniline
90040	o-Anisidine
1332214	Asbestos
71432	Benzene (including benzene from gasoline)
92875	Benzidine
98077	Benzotrichloride
100447	Benzyl chloride
92524	Biphenyl
117817	Bis(2-ethylhexyl)phthalate (DEHP)
542881	Bis(chloromethyl)ether
75252	Bromoform
106990	1,3-Butadiene
156627	Calcium cyanamide
105602	Caprolactam(See Modification)
133062	Captan
63252	Carbaryl
75150	Carbon disulfide
56235	Carbon tetrachloride
463581	Carbonyl sulfide
120809	Catechol
133904	Chloramben
57749	Chlordane
7782505	Chlorine
79118	Chloroacetic acid
532274	2-Chloroacetophenone
108907	Chlorobenzene
510156	Chlorobenzilate
67663	Chloroform
107302	Chloromethyl methyl ether
126998	Chloroprene
1319773	Cresols/Cresylic acid (isomers and mixture)
95487	o-Cresol
108394	m-Cresol
106445	p-Cresol
98828	Cumene
94757	2,4-D, salts and esters
3547044	DDE
334883	Diazomethane
132649	Dibenzofurans
96128	1,2-Dibromo-3-chloropropane
84742	Dibutylphthalate
106467	1,4-Dichlorobenzene(p)
91941	3,3-Dichlorobenzidene
111444	Dichloroethyl ether (Bis(2-chloroethyl)ether)
542756	1,3-Dichloropropene

CAS Number	Chemical Name
302012	Hydrazine
7647010	Hydrochloric acid
7664393	Hydrogen fluoride (Hydrofluoric acid)
7783064	Hydrogen sulfide(See Modification)
123319	Hydroquinone
78591	Isophorone
58899	Lindane (all isomers)
108316	Maleic anhydride
67561	Methanol
72435	Methoxychlor
74839	Methyl bromide (Bromomethane)
74873	Methyl chloride (Chloromethane)
71556	Methyl chloroform (1,1,1-Trichloroethane)
78933	Methyl ethyl ketone (2-Butanone)(See Modification)
60344	Methyl hydrazine
74884	Methyl iodide (Iodomethane)
108101	Methyl isobutyl ketone (Hexone)
624839	Methyl isocyanate
80626	Methyl methacrylate
1634044	Methyl tert butyl ether
101144	4,4-Methylene bis(2-chloroaniline)
75092	Methylene chloride (Dichloromethane)
101688	Methylene diphenyl diisocyanate (MDI)
101779	4,4'-Methylenedianiline
91203	Naphthalene
98953	Nitrobenzene
92933	4-Nitrobiphenyl
100027	4-Nitrophenol
79469	2-Nitropropane
684935	N-Nitroso-N-methylurea
62759	N-Nitrosodimethylamine
59892	N-Nitrosomorpholine
56382	Parathion
82688	Pentachloronitrobenzene (Quintobenzene)
87865	Pentachlorophenol
108952	Phenol
106503	p-Phenylenediamine
75445	Phosgene
7803512	Phosphine
7723140	Phosphorus
85449	Phthalic anhydride
1336363	Polychlorinated biphenyls (Aroclors)
1120714	1,3-Propane sultone
57578	beta-Propiolactone
123386	Propionaldehyde
114261	Propoxur (Baygon)
78875	Propylene dichloride (1,2-Dichloropropane)
75569	Propylene oxide
75558	1,2-Propylenimine (2-Methyl aziridine)
91225	Quinoline
106514	Quinone
100425	Styrene
96093	Styrene oxide
1746016	2,3,7,8-Tetrachlorodibenzo-p-dioxin
79345	1,1,2,2-Tetrachloroethane
127184	Tetrachloroethylene (Perchloroethylene)

Table 3-7
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Federally Regulated Hazardous Air Pollutants

CAS Number	Chemical Name
62737	Dichlorvos
111422	Diethanolamine
121697	N,N-Diethyl aniline (N,N-Dimethylaniline)
64675	Diethyl sulfate
119904	3,3-Dimethoxybenzidine
60117	Dimethyl aminoazobenzene
119937	3,3'-Dimethyl benzidine
79447	Dimethyl carbamoyl chloride
68122	Dimethyl formamide
57147	1,1-Dimethyl hydrazine
131113	Dimethyl phthalate
77781	Dimethyl sulfate
534521	4,6-Dinitro-o-cresol, and salts
51285	2,4-Dinitrophenol
121142	2,4-Dinitrotoluene
123911	1,4-Dioxane (1,4-Diethyleneoxide)
122667	1,2-Diphenylhydrazine
106898	Epichlorohydrin (l-Chloro-2,3-epoxypropane)
106887	1,2-Epoxybutane
140885	Ethyl acrylate
100414	Ethyl benzene
51796	Ethyl carbamate (Urethane)
75003	Ethyl chloride (Chloroethane)
106934	Ethylene dibromide (Dibromoethane)
107062	Ethylene dichloride (1,2-Dichloroethane)
107211	Ethylene glycol
151564	Ethylene imine (Aziridine)
75218	Ethylene oxide
96457	Ethylene thiourea
75343	Ethylidene dichloride (1,1-Dichloroethane)
50000	Formaldehyde
76448	Heptachlor
118741	Hexachlorobenzene
87683	Hexachlorobutadiene
77474	Hexachlorocyclopentadiene
67721	Hexachloroethane
822060	Hexamethylene-1,6-diisocyanate
680319	Hexamethylphosphoramide
110543	Hexane

CAS Number	Chemical Name
7550450	Titanium tetrachloride
108883	Toluene
95807	2,4-Toluene diamine
584849	2,4-Toluene diisocyanate
95534	o-Toluidine
8001352	Toxaphene (chlorinated camphene)
120821	1,2,4-Trichlorobenzene
79005	1,1,2-Trichloroethane
79016	Trichloroethylene
95954	2,4,5-Trichlorophenol
88062	2,4,6-Trichlorophenol
121448	Triethylamine
1582098	Trifluralin
540841	2,2,4-Trimethylpentane
108054	Vinyl acetate
593602	Vinyl bromide
75014	Vinyl chloride
75354	Vinylidene chloride (1,1-Dichloroethylene)
1330207	Xylenes (isomers and mixture)
95476	o-Xylenes
108383	m-Xylenes
106423	p-Xylenes
0	Antimony Compounds
0	Arsenic Compounds (inorganic including arsine)
0	Beryllium Compounds
0	Cadmium Compounds
0	Chromium Compounds
0	Cobalt Compounds
0	Coke Oven Emissions
0	Cyanide Compounds1
0	Glycol ethers2
0	Lead Compounds
0	Manganese Compounds
0	Mercury Compounds
0	Fine mineral fibers3
0	Nickel Compounds
0	Polycylic Organic Matter4
0	Radionuclides (including radon)5
0	Selenium Compounds

*List of federally regulated HAPs taken from 112b - The Clean Air Act Amendments of 1990 List of Hazardous Air Pollutants. List currently contains 187 regulated HAPs. http://www.epa.gov/ttn/atw/orig189.html

NOTE: For all listings above which contain the word "compounds" and for glycol ethers, the following applies: Unless otherwise specified, these listings are defined as including any unique chemical substance that contains the named chemical (i.e., antimony, arsenic, etc.) as part of that chemical's infrastructure.

1. X'CN where X = H' or any other group where a formal dissociation may occur. For example KCN or Ca(CN)2

2. Includes mono- and di- ethers of ethylene glycol, diethylene glycol, and triethylene glycol R-(OCH2CH2)n -OR' where
n = 1, 2, or 3
R = alkyl or aryl groups
R' = R, H, or groups which, when removed, yield glycol ethers with the structure: R-(OCH2CH)n-OH. Polymers are excluded from the glycol category.(See Modification)

3. Includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.

4. Includes organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100 º C.

5. A type of atom which spontaneously undergoes radioactive decay.

Table 3-7b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Federally Regulated Hazardous Air Pollutants - Modifications

CAS Number	Regulated HAP	Modification
105602	Caprolactam	On July 19, 1993, EPA received a petition from AlliedSignal, Inc., BASF Corporation, and DSM Chemicals North America, Inc. to delete caprc the hazardous air pollutant list in Section 112(b)(1), 42 U.S.C., Section 7412(b)(1). A Notice of Recipt was published (58FR45081, August 26 were adequate to support decision making. After a comprehensive review of the data submitted, the EPA published a proposal to delist ca September 18, 1995). In order to help address public concern,on March 13, 1995, EPA executed two detailed agreements with AlliedSignal Carolina manufacturing facility and another facility located in Chesterfield, Virginia, copies of which are included in the public docket for th that, if caprolactam was delisted pursuant to the proposal, AlliedSignal would install emissions controls which EPA believed would be equiv would have been required had EPA issued a standard to control these sources under Section 112. The agreed emissions controls are incorp operating permits for the affected facilities, and will be in place years earlier than controls would have otherwise been required. In additio establish a citizen advisory panel concerning the Irmo facility in order to improve communications with the community and to assure that implementation of the agreed emission reductions. The public requesting a public hearing. On November 28, 1995, the EPA published a no extention of the comment period (60FR58589). After considering all public comments, the EPA published a final rule delisting caprolactam
7783064	Hydrogen Sulfide	A clerical error led to the inadvertent addition of hydrogen sulfide to the Section 112(b) list of Hazardous Air Pollutants. However, a Joint F sulfide from the Section 112(b)(1) list was passed by the Senate on August 1, 1991 (Congressional Record page S11799), and the House of 25, 1991 (Congressional Record pages H11217-H11219). The Joint Resolution was approved by the President on December 4, 1991. Hydro 112(r) and is subject to the accidental release provisions.
78933	Methyl ethyl ketone (2-Butanone)	On December 19, 2005 the Environmental Protection Agency removed methyl ethyl ketone (MEK) from the list of toxic air pollutants. The now 187. After extensive technical review and consideration of public comments, EPA concluded that potential exposures to MEK emitted from indu reasonably be anticipated to cause human health or environmental problems. MEK is used as a solvent in the surface coatings industry, specifically in manufacturing vinyl lacquers, some lacquers and acrylics. Industrie adhesives, magnetic tapes, printing inks, degreasing and cleaning fluids, as a dewaxing agent for lubricating oils and as an intermediate in t and perfumes. Emissions of MEK will continue to be regulated as a volatile organic compound because of its contribution to the formation of ground-leve
0	Glycol Ethers	On November 21, 2003 (68FR65648), the EPA proposed to remove the compound ethylene glycol monobutyl ether (EGBE) (2-Butoxyethan (CAS) No. 111-76-2) from the group of glycol ethers. On November 29, 2004 (69FR69320) this proposal was made final. On January 12, 1999 (64FR1780), the EPA proposed to modify the definition of glycol ethers to exclude surfactant alcohol ethoxylates and August 2, 2000 (65FR47342), the EPA published the final action. This action deletes each individual compound in a group called the surfact derivatives (SAED) from the glycol ethers category in the list of hazardous air pollutants (HAP) established by section 112(b)(1) of the Clear 112(b)(3)(D) of the CAA, EPA may delete specific substances from certain listed categories, including glycol ethers. To implement this actio glycol ethers to exclude the deleted compounds. This action is also making conforming changes with respect to designation of hazardous s Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). These final rules are being issued by EPA in response t exposure and hazards of SAED that was prepared by the Soap and Detergent Association (SDA) and submitted to EPA. Based on this inforn determination that there are adequate data on the health and environmental effects of these substances to determine that emissions, am bioaccumulation, or deposition of these substances may not reasonably be anticipated to cause adverse human health or environmental e

Notes:
Taken from Modifications To The 112(b)1 Hazardous Air Pollutants - http://www.epa.gov/ttn/atw/pollutants/atwsmod.html

Table 4-1
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of BACT Determinations - Greenhouse Gases

Submerged Arc Furnaces - AA-201

Emission Rates
CO_2e - 381,866 tons/year

Add on Control or Work Practice Standards
1. Utilization of a new generation furnace (i.e., semi-enclosed SAF); and
2. Good operation and maintenance to improve energy efficiency.

Natural Gas Combustion Equipment - AA-202

Emission Rates

- CO_2 – 117 lb/MMBtu
- Methane – 0.0022 lb/MMBtu
- N_2O – 0.0002 lb/MMBtu

Add on Control or Work Practice Standards
1. Good combustion practices,
2. Combustion of natural gas only,
3. Selection of the most energy efficient burner design based on engineering selection process, and
4. Periodic maintenance.

Table 4-2
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of BACT Determinations - $PM_{10}/PM_{2.5}$

Submerged Arc Furnaces - AA-201

Emission Rates
$PM_{10}/PM_{2.5}$ – 0.005 gr/dscf

Add on Control or Work Practice Standards
Use of fabric filter control (i.e., baghouse).

Castlong Frames - AA-201a

Emission Rate
No emission limit is being proposed since there is no formal method for quantifying emissions from this type of indoor operation

Add on Control or Work Practice Standards
Best Management Practices to minimize the generation of $PM/PM_{10}/PM_{2.5}$ fugitive emissions from the casting frame operation

Wood Chipper - AA-201b

Emission Rates
No emission limit is being proposed for this operation since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate

Add on Control or Work Practice Standards
1. Limited hours of operation; and
2. Operation of the wood chipper with an enclosure or similar that will minimize fugitive dust emissions.

Natural Gas Combustion Equipment - AA-202

Emission Rates
None

Add on Control or Work Practice Standards
1. Combustion of natural gas; and
2. Good operating practices.

Material Storage and Handling - AA-101, AA-102, AA-103, AA-101a, AA-102a, AA-103a, AA-104, AA-105, AA-106, AA-403

Material Transfer to and From Coal Storage Pile (AA-101)
No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate
Add-on Control or Work Practice Standard -
• Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
• Development of a fugitive dust control plan

Material Transfer to and From Wood Storage Pile (AA-102)
No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate
Add-on Control or Work Practice Standard -
• Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
• Development of a fugitive dust control plan

Material Transfer to and From Quartz and Limestone Storage Piles (AA-103 and AA-104)
No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate
Add-on Control or Work Practice Standard -
• Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
• Development of a fugitive dust control plan

Material Handling (Coal, Wood, Quartz) Baghouse (AA-101a, AA-102a, AA-103a) and Product Handling Area Baghouse (AA-301 and AA-403)
Emission Rate - 0.003 gr/dscf*

*It should be noted that MS Silicon is voluntarily designing the baghouse to meet 0.0015 gr/dscf to minimize the potential impact on $PM_{10}/PM_{2.5}$ air quality. This emission rate does not constitute BACT

Add-on control or Work Practice Standard -
Fabric Filter Baghouse for PM control

Storage Pile Processing (AA-105)
No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate
Add-on Control or Work Practice Standard -
The development of a fugitive dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, wind screens and speed reduction, as required

Storage Pile Wind Erosion (AA-106)
No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate
Add-on Control or Work Practice Standard -
Implementation of a fugitive dust control plan. Visible emissions from the storage piles shall be controlled by the application of water, other dust suppressants or the use of wind screens, as needed

Silica Fume Silo (AA-404)

Emission Rates
$PM_{10}/PM_{2.5}$ – 0.01 gr/dscf

Add on Control or Work Practice Standards
Use of fabric filter control (i.e., bin vent filter)

Paved and Unpaved Roads (AA-402, AA-402a)

Emission Rates
No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

Add on Control or Work Practice Standards
Development of dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required.

Emergency Equipment - AA-301

Emission Rates
None

Add on Control or Work Practice Standards
1. Compliance with NSPS IIII; and
2. Good combustion/operating practices.

Table 4-3
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of BACT Determinations - NO_x

Submerged Arc Furnaces (AA-201)

Emission Rates
NO_x - 45 lbs/ton (averaged over a 30-day period) of silicon produced

Add on Control or Work Practice Standards
None

Natural Gas Combustion Equipment (AA-202)

Emission Rates
NO_x - 0.08 lbs/MMBtu

Add on Control or Work Practice Standards
1. Low NO_x or equivalent burners/technology;
2. Combustion of clean fuel; and
3. Good combustion practices.

Emergency Equipment (AA-501)

Emission Rates
None

Add on Control or Work Practice Standards
1. Compliance with NSPS IIII;
2. Good combustion/operating practices; and
3. Use of ultra low sulfur diesel (ULSD) fuel.

Table 4-4
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of BACT Determinations - CO

Submerged Arc Furnaces (AA-201)

Emission Rates
CO - 34 lbs/ton (averaged over a 30-day period) of silicon produced

Add on Control or Work Practice Standards
1. Utilization of a semi-enclosed SAF design.
2. Good combustion and operating practices

Natural Gas Combustion Equipment (AA-202)

Emission Rates
CO - 0.0840 lb/MMBtu

Work Practice Standards
1. Combustion of natural gas; and
2. Good combustion practices.

Emergency Equipment (AA-501)

Emission Rates
None

Add on Control or Work Practice Standards
1. Compliance with NSPS IIII; and
2. Good combustion/operating practices.

Table 4-5
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of BACT Determinations - SO_2

Submerged Arc Furnaces (AA-201)

Emission Rates
SO_2 - 52 lbs/ton (averaged over a 30-day period) of silicon produced

Add on Control or Work Practice Standards
Utilization of low sulfur content material, where technically feasible.

Natural Gas Combustion Equipment (AA-202)

Emission Rates
SO_2 - 0.0006 lbs/MMBtu

Add on Control or Work Practice Standards
1. Combustion of clean fuel; and
2. Good combustion practices.

Emergency Equipment (AA-501)

Emission Rates
None

Add on Control or Work Practice Standards
1. Compliance with NSPS IIII;
2. Good combustion/operating practices; and
3. Use of ultra low sulfur diesel (ULSD) fuel.

Table 4-6
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
Summary of BACT Determinations - VOC

Submerged Arc Furnaces (AA-201)

Emission Rates
VOC - 2.4 lbs/ton (averaged over a 30-day period) of silicon produced

Add on Control or Work Practice Standards
Good operating practices

Natural Gas Combustion Equipment (AA-202)

Emission Rates
VOC - 0.0055 lb/MMBtu (AP-42 emission factor)

Work Practice Standards
1. Combustion of natural gas; and
2. Good combustion practices.

Emergency Equipment (AA-501)

Emission Rates
None

Add on Control or Work Practice Standards
1. Compliance with NSPS IIII; and
2. Good combustion/operating practices.

Table 5-1
MS Silicon
Proposed Silicon Manufacturing Plant
Summary of Applicable Standards

Air Pollutant	[illegible]			[illegible]			[illegible]			[illegible]	
	Limit	Averaging Period	Concentration Average	Limit	Averaging Period	Concentration Average	Limit	Averaging Period	Concentration Average	Limit	Averaging Period
PM_{10}	5	24-Hour	Highest first high of the 5 years	10	24-Hour	Highest first high of the 5 years	30	24-Hour	Highest of the second high from each of the 5 years	150	24-H
	1	Annual	Highest of the 5 years	--	--	--	17	Annual	Highest of the 5 years	--	Ann
$PM_{2.5}$	1.2	24-Hour	Average of the highest from each year	4	24-Hour	Average of the highest from each year	9	24-Hour	Highest of the second high from each of the 5 years	35	24-H
	0.3	Annual	Average of the highest from each year	--	--	--	4	Annual	Highest of the 5 years	12	Ann
NO_2	7.52	1-Hour	Average of the highest maximum daily 1-hour concentration from each year	--	--	--	--	--	--	188	1-H
	1	Annual	Highest of the 5 years	14	Annual	Highest of the 5 years	25	Annual	Highest of the 5 years	100	Ann
SO_2	7.8	1-Hour	Average of the highest maximum daily 1-hour concentration from each year	--	--	--	--	--	--	196	1-H
	25	3-Hour	Highest first high of the 5 years	--	--	--	512	3-Hour	Highest of the second high from each of the 5 years	1,300	3-H
	5	24-Hour	Highest first high of the 5 years	13	24-Hour	Highest first high of the 5 years	91	24-Hour	Highest of the second high from each of the 5 years	365	24-H
	1	Annual	Highest of the 5 years	--	--	--	20	Annual	Highest of the 5 years	80	Ann
CO	2,000	1-Hour	Average of the highest from each year	--	--	--	--	--	--	40,000	1-H
	500	8-Hour	Average of the highest from each year	575	8-Hour	Highest first high of the 5 years	--	--	--	10,000	8-H

Table 5-2
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Summary of Representative Ambient Air Pollutant Concentrations

Air Pollutant	Location of Monitor	Monitor Location Description	Averaging Period	Measured Concentration*	Measured Concentration Converted to ug/m³	Notes
O_3	Tupelo - Lee County	Tupelo Regional Airport	8-Hour	66 ppm	--	2012 Design Value
PM_{10}*	Jackson - Hinds County	Town	24-Hour	46 ug/m³	46	1st High Averaged Over 3 Years
				30 ug/m³	30	2nd High Averaged Over 3 Years
$PM_{2.5}$	Hernando - DeSoto County	Rural Area	Annual	9.8 ug/m³	9.8	2012 Annual Average Design Value***
	Grenada - Grenada County			9.5 ug/m³	9.5	
	Average			9.65 ug/m³	9.65	
$PM_{2.5}$	Hernando - DeSoto County	Rural Area	24-Hour	18 ug/m³	18	2012 24-Hour Average Design Value***
	Grenada - Grenada County			19 ug/m³	19	
	Average			18.5 ug/m³	18.5	
NO_2	Pascagoula - Jackson County	Town	Annual	4 ppb	7.5	2012 Annual Average
			1-Hour	34 ppb	63.9	2012 1-Hour Average Design Value
SO_2****	Pascagoula - Jackson County	Town	1-Hour	27 ppb	70.7	2012 1-Hour Average Design Value
			3-Hour	27 ppb	70.7	****
			24-Hour	7 ppb	18.3	Highest 2nd High Over 3 Years
			Annual	2.16 ppb	5.7	****
CO*****	Jackson - Hinds County	Town	1-Hour	1.3 ppm	1482	2011 1-Hour Highest 2nd High
			8-Hour	1.0 ppm	1140	2011 8-Hour Highest 2nd High

Notes:
*Background concentrations based on MDEQ's 2012 Air Quality Data Summary
**PM_{10} background concentrations based on EPA's AirData Monitoring Value Report for 2010, 2011 and 2012.
***The monitor located in Lee County is located near the Tupelo Regional Airport. This airport may affected measurements at the $PM_{2.5}$ monitor. Because of this potential influence the two monitors located in DeSoto County (Hernando) and Grenada County (Genada) were considered more representative of the proposed project site. The measured concentrations from these monitors were averaged to represent the background $PM_{2.5}$ levels at the proposed plant site.

****SO_2 24-hour background concentration based on EPA's AirData Monitoring Value Report for 2010, 2011 and 2012. 3-hour concentration was set equal to the 1-hour concentration which was taken from MDEQ's 2012 Air Quality Data Summary. Annual background concentration is based on multiplying the 1-hour concentration by 0.08. The conversion factor obtained from EPA Screen3 conversion factors (converting 1-hour concentrations to other averaging periods).

*****CO 1-hour and 8-hour background concentrations based on the highest 2nd high from EPA's AirData Monitoring Value Report for 2010, 2011 and 2012.
******Concentrations convered from ppm/ppb to ug/m3 based on AP-42, Appendix A - Miscellaneous Data & Conversion Factors (Sept. 1985), Conversion Factors for Various Substances - Gaseous Pollutants

- O_3 - 1 ppm, volume = 1960 μg/m³
- NO_2 - 1 ppm, volume = 1880 μg/m³
- SO_2 - 1 ppm, volume = 2610μg/m³
- CO - 1 ppm, volume = 1.14 mg/m³

Table 5-3
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Emissions Inventory

Point Sources

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SAF1	AA-201	Four (4) Submerged Arc Furnaces with Baghouse Control Device	91.44	300	1.93	6.3	19.37	63.5	449.82	350.01	3.49	0.44	3.49	0.44	123.75	15.59
SAF2			91.44	300	1.93	6.3	19.37	63.5	449.82	350.01	3.49	0.44	3.49	0.44	123.75	15.59
SAF3			91.44	300	1.93	6.3	19.37	63.5	449.82	350.01	3.49	0.44	3.49	0.44	123.75	15.59
SAF4			91.44	300	1.93	6.3	19.37	63.5	449.82	350.01	3.49	0.44	3.49	0.44	123.75	15.59
RM1	BG5*	Raw Material Baghouse	12.19	40.0	1.37	4.5	18.29	60.0	293.15	68	0.77	0.097	0.77	0.097	--	--
RM2			24.384	80.0	1.37	4.5	18.29	60.0	293.15	68	0.77	0.097	0.77	0.097	--	--
PR1	BG6**	Product Refinement & Handling Baghouse	12.19	40.0	1.07	3.5	18.29	60.0	293.15	68	0.39	0.049	0.39	0.049	--	--
PR2			24.384	80.0	1.07	3.5	18.29	60.0	293.15	68	0.39	0.049	0.77	0.097	--	--

Notes:

*Emission units AA-101a, AA-102a, AA-103a exhaust to this baghouse

**Emission unit AA-301 exhausts to this baghouse

Volume Sources

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F1	AA-202	Four (4) Natural Gas-Fired Ladle Preheaters	20.01	65.6	6.97	18.62	22.9	61.1	0.010	0.00126	0.010	0.00126	1.6	0.20	0.012	0.0015
F2			20.01	65.6	6.97	18.62	22.9	61.1	0.010	0.00126	0.010	0.00126	1.6	0.20	0.012	0.0015
CF1	AA-201a	Casting Frames	14.00	45.9	5.61	13.02	18.4	42.7	0.006	0.000756	0.006	0.000756	--	--	--	--
CF2			14.00	45.9	5.61	6.51	18.4	21.4	0.006	0.000756	0.006	0.000756	--	--	--	--

Area Sources

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PA - Process Area															
PA	--	Process Area	9.14	30.0	229.66	339.73	78,022.39	753.5	1114.6	839,826.04	1.35	0.1706	2.19E-06	0.24	0.0308	3.95E-07
	AA-101, AA-102, AA-103 & AA-104	Material Handling	--	--	--	--	--	--	--	--	0.411	0.052	--	0.0616	0.0078	--
	AA-403	Slag to tie into Raw Material Baghouse	--	--	--	--	--	--	--	--	No Emissions from this Source			No Emissions from this Source		
	AA-404	Silica Fume Silos	--	--	--	--	--	--	--	--	0.03	0.0038	--	0.03	0.0038	--
	AA-402	Vehicle Traffic	--	--	--	--	--	--	--	--	0.8447	0.106	--	0.08447	0.0106	--
	AA-403a	Raw Material Transfer Vehicles	--	--	--	--	--	--	--	--	0.0685	0.0086	--	0.0685	0.0086	--
SP - Pile Storage Area															
SP	--	Pile Storage Area	9.14	30.0	166.03	105.72	17,552.69	544.7	346.9	188,935.60	0.4866	0.0613	3.49E-06	0.1717	0.0216	1.23E-06
	AA-102b	Wood Chipper	--	--	--	--	--	--	--	--	0.04	5.04E-03	--	0.04	5.04E-03	--
	AA-105	Bulldozing	--	--	--	--	--	--	--	--	0.3896	4.91E-02	--	0.0464	5.85E-03	--
	AA-106	Storage Piles	--	--	--	--	--	--	--	--	0.05696	7.18E-03	--	0.0853	1.08E-02	--

Table 5-4a
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to SILs

Pollutant	Averaging Period	Meteorological Year(s)	Predicted Concentration (µg/m³)	Date of Concentration (YY/MM/DD/HH)	Receptor Easting (m UTM)	Receptor Northing (m UTM)	SIL (µg/m³)	Concentration Averaging	Concentration Exceeds Modeled SIL
PM_{10}	24-hour	2007	20.47	07/10/05/24	378671.74	3852133.81	5	Highest first high of the 5 years	Yes
		2008	19.03	08/10/05/24	378565.00	3851620.00			Yes
		2009	16.00	09/09/18/24	378653.08	3852095.12			Yes
		2010	16.83	10/07/04/24	378810.99	3852298.80			Yes
		2011	14.63	11/10/20/24	379365.00	3851920.00			Yes
		2007 - 2011	20.47	07/10/05/24	378671.74	3852133.81			Yes
	Annual	2007	3.53	--	378852.62	3852323.27	1.00	Highest of the 5 years	Yes
		2008	2.98	--	378852.62	3852323.27			Yes
		2009	3.25	--	379000.41	3852321.36			Yes
		2010	3.25	--	379000.41	3852321.30			Yes
		2011	3.59	--	379049.67	3852320.72			Yes
		2007 - 2011	--	--	--	--			Yes
$PM_{2.5}$	24-hour	2007	9.41	--	378671.74	3852133.81	1.2	Average of the highest from each year	Yes
		2008	7.79	--	378709.06	3852211.17			Yes
		2009	7.42	--	378653.08	3852095.12			Yes
		2010	8.22	--	378810.99	3852298.8			Yes
		2011	7.77	--	378852.62	3852323.27			Yes
		2007 - 2011	7.43	--	378852.62	3852323.27			Yes
	Annual	2007	1.94	--	378852.62	3852323.27	0.3	Average of the highest from each year	Yes
		2008	1.66	--	378852.62	3852323.27			Yes
		2009	1.62	--	379000.41	3852321.36			Yes
		2010	1.61	--	379000.41	3852321.36			Yes
		2011	1.86	--	379000.41	3852321.36			Yes
		2007 - 2011	1.50	--	379000.41	3852321.36			Yes
NO_2	1-hour	2007	113.20	--	378886.76	3851765.89	7.52	Average of the highest maximum daily 1-hour concentration from each year	Yes
		2008	119.77	--	378935.83	3851765.00			Yes
		2009	114.21	--	380565.00	3851820.00			Yes
		2010	110.72	--	378886.76	3851765.89			Yes
		2011	111.12	--	378935.83	3851765.00			Yes
		2007 - 2011	111.35	--	378935.83	3851765.00			Yes
	Annual	2007	6.19	--	378886.76	3851765.89	1	Highest of the 5 years	Yes
		2008	4.57	--	378886.76	3851765.89			Yes
		2009	4.96	--	378788.62	3851767.67			Yes
		2010	5.48	--	378788.62	3851767.67			Yes
		2011	5.02	--	378788.62	3851767.67			Yes
		2007 - 2011	--	--	--	--			Yes
SO_2	1-hour	2007	109.37	07/12/30/09	380165.00	3850920.00	7.8	Average of the highest maximum daily 1-hour concentration from each year	Yes
		2008	120.94	08/02/24/09	377365.00	3850720.00			Yes
		2009	126.34	09/01/06/12	380665.00	3851820.00			Yes
		2010	118.22	10/01/28/10	380165.00	3852220.00			Yes
		2011	95.45	11/02/23/09	376365.00	3851820.00			Yes
		2007 - 2011	126.34	09/01/06/12	380665.00	3851820.00			Yes
	3-hour	2007	67.70	07/06/18/12	379065.00	3852520.00	25	Highest first high of the 5 years	Yes
		2008	65.84	08/10/22/12	378865.00	3852620.00			Yes
		2009	73.72	09/01/06/15	380565.00	3851120.00			Yes
		2010	67.60	10/06/22/12	379065.00	3852620.00			Yes
		2011	67.81	11/09/01/12	379265.00	3852620.00			Yes
		2007 - 2011	73.72	09/01/06/15	380565.00	3851120.00			Yes
	24-hour	2007	26.11	07/09/05/24	378965.00	3852620.00	5	Highest first high of the 5 years	Yes
		2008	26.10	08/06/06/24	379065.00	3852820.00			Yes
		2009	30.31	09/06/17/24	379665.00	3852020.00			Yes
		2010	28.77	10/06/14/24	379665.00	3852120.00			Yes
		2011	27.24	11/05/28/24	379365.00	3852820.00			Yes
		2007 - 2011	30.31	09/06/17/24	379665.00	3852020.00			Yes
	Annual	2007	4.69	--	378965.00	3852720.00	1	Highest of the 5 years	Yes
		2008	3.32	--	378865.00	3852920.00			Yes
		2009	3.39	--	379365.00	3852820.00			Yes
		2010	4.03	--	379265.00	3852720.00			Yes
		2011	3.91	--	379365.00	3852820.00			Yes
		2007 - 2011	--	--	--	--			Yes
CO	1-hour	2007	116.74	07/01/20/06	378886.76	3851765.89	2000	Average of the highest from each year	No
		2008	123.52	08/05/21/22	378886.76	3851765.89			No
		2009	117.16	09/02/23/07	378935.83	3851765.00			No
		2010	114.18	10/01/12/21	378886.76	3851765.89			No
		2011	114.59	11/12/17/07	378935.83	3851765.00			No
		2007 - 2011	123.52	08/05/21/22	378886.76	3851765.89			No
	8-Hour	2007	63.03	07/12/24/08	378951.14	3852322.00	500	Average of the highest from each year	No
		2008	61.97	08/04/21/08	378886.76	3851765.89			No
		2009	53.96	09/11/20/24	378788.62	3851767.67			No
		2010	47.26	10/11/13/08	379000.41	3852321.36			No
		2011	57.65	11/11/18/08	378788.62	3851767.67			No
		2007 - 2011	63.03	07/12/24/08	378951.14	3852322.00			No

Table 5-4b
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to SMCs

Pollutant	Averaging Period	Meteorological Data Period	Modeled Concentration (µg/m³)	Date of Concentration (YY/MM/DD/HH)	Receptor Point (E Meters)	Receptor Point (N Meters)	SMC (µg/m³)	Concentration Av
PM_{10}	24-hour	2007	20.47	07/10/05/24	378671.74	3852133.81	10	Highest first high c years
		2008	19.03	08/10/05/24	378565.00	3851620.00		
		2009	16.00	09/09/18/24	378653.08	3852095.12		
		2010	16.83	10/07/04/24	378810.99	3852298.80		
		2011	14.63	11/10/20/24	379365.00	3851920.00		
		2007 - 2011	20.47	07/10/05/24	378671.74	3852133.81		
$PM_{2.5}$	24-hour	2007	9.41	--	378671.74	3852133.81	4	Average of the high each year
		2008	7.79	--	378709.06	3852211.17		
		2009	7.42	--	378653.08	3852095.12		
		2010	8.22	--	378810.99	3852298.8		
		2011	7.77	--	378852.62	3852323.27		
		2007 - 2011	7.43	--	378852.62	3852323.27		
NO_2	Annual	2007	6.19	--	378886.76	3851765.89	14	Highest of the 5
		2008	4.57	--	378886.76	3851765.89		
		2009	4.96	--	378788.62	3851767.67		
		2010	5.48	--	378788.62	3851767.67		
		2011	5.02	--	378788.62	3851767.67		
		2007 - 2011	--	--	--	--		
SO_2	24-hour	2007	26.11	07/09/05/24	378965.00	3852620.00	13	Highest first high c years
		2008	26.10	08/06/06/24	379065.00	3852820.00		
		2009	30.31	09/06/17/24	379665.00	3852020.00		
		2010	28.77	10/06/14/24	379665.00	3852120.00		
		2011	27.24	11/05/28/24	379365.00	3852820.00		
		2007 - 2011	30.31	09/06/17/24	379665.00	3852020.00		
CO	8-Hour	2007	63.03	07/12/24/08	378951.14	3852322.00	575	Highest first high c years
		2008	61.97	08/04/21/08	378886.76	3851765.89		
		2009	53.96	09/11/20/24	378788.62	3851767.67		
		2010	47.26	10/11/13/08	379000.41	3852321.36		
		2011	57.65	11/11/18/08	378788.62	3851767.67		
		2007 - 2011	63.03	07/12/24/08	378951.14	3852322.00		

Table 5-4c
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to PSD Class II Increments

Pollutant	Averaging Period	Meteorological Data Period	Modeled Concentration (µg/m³)	Date of Concentration (YY/MM/DD/HH)	Receptor Point (X Meters)	Receptor Point (Y Meters)	PSD Class II Increment (µg/m³)	Concentration Ratio (%)
PM_{10}	24-hour	2007	16.07	07/08/09/24	379363.47	3852190.55	30	Highest of the second high from each of the 5 years
		2008	16.68	08/09/22/24	378565.00	3851520.00		
		2009	14.46	09/09/23/24	378665.00	3852120.00		
		2010	13.96	10/08/31/24	378852.62	3852323.27		
		2011	13.49	11/08/22/24	378739.55	3851768.56		
		2007 - 2011	16.68	08/09/22/24	378565.00	3851520.00		
	Annual	2007	3.53	--	378852.62	3852323.27	17	Highest of the 5 years
		2008	2.98	--	378852.62	3852323.27		
		2009	3.25	--	379000.41	3852321.36		
		2010	3.25	--	379000.41	3852321.3		
		2011	3.59	--	379049.67	3852320.72		
		2007 - 2011	--	--	--	--		
$PM_{2.5}$	24-hour	2007	7.55	--	378852.62	3852323.27	9	Highest of the second high from each of the 5 years
		2008	7.17	--	378565.00	3851620.00		
		2009	7.12	--	378852.62	3852323.27		
		2010	7.82	--	378810.99	3852298.80		
		2011	6.74	--	378852.62	3852323.27		
		2007 - 2011	7.06	--	378852.62	3852323.27		
	Annual	2007	1.94	--	378852.62	3852323.27	4	Highest of the 5 years
		2008	1.66	--	378852.62	3852323.27		
		2009	1.62	--	379000.41	3852321.36		
		2010	1.61	--	379000.41	3852321.36		
		2011	1.86	--	379000.41	3852321.36		
		2007 - 2011	--	--	--	--		
NO_2	Annual	2007	6.19	--	378886.76	3851765.89	25	Highest of the 5 years
		2008	4.57	--	378886.76	3851765.89		
		2009	4.96	--	378788.62	3851767.67		
		2010	5.48	--	378788.62	3851767.67		
		2011	5.02	--	378788.62	3851767.67		
		2007 - 2011	--	--	--	--		
SO_2	3-hour	2007	66.24	07/08/11/12	378865.00	3851420.00	512	Highest of the second high from each of the 5 years
		2008	61.77	08/07/17/12	378765.00	3852720.00		
		2009	63.13	09/10/19/12	379165.00	3852620.00		
		2010	65.68	10/09/06/15	379065.00	3852620.00		
		2011	64.06	11/10/25/15	379265.00	3852620.00		
		2007 - 2011	66.24	07/08/11/12	378865.00	3851420.00		
	24-hour	2007	24.84	07/07/16/24	378965.00	3852720.00	91	Highest of the second high from each of the 5 years
		2008	24.93	08/06/07/24	379065.00	3852720.00		
		2009	25.46	09/06/20/24	379465.00	3851620.00		
		2010	24.46	10/07/03/24	379165.00	3852820.00		
		2011	23.30	11041924	379465.00	3852920.00		
		2007 - 2011	25.46	09/06/20/24	379465.00	3851620.00		
	Annual	2007	4.69	--	378965.00	3852720.00	20	Highest of the 5 years
		2008	3.32	--	378865.00	3852920.00		
		2009	3.39	--	379365.00	3852820.00		
		2010	4.03	--	379265.00	3852720.00		
		2011	3.91	--	379365.00	3852820.00		
		2007 - 2011	--	--	--	--		

Table 5-4d
Mississippi Silicon LLC
Proposed Silicon Manufacturing Plant
Predicted Concentrations Compared to NAAQS

Pollutant	Averaging Period	Meteorological Data Period	Predicted Concentration (µg/m³)	Date of Concentration (YY/MM/DD/HH)	Receptor Point (X Meters)	Receptor Point (Y Meters)	Background Concentration (µg/m³)	Predicted Concentration Inclusive (µg/m³)	NAAQS (µg/m³)	Concentration Average
PM_{10}	24-hour	2007	13.74	07/07/28/24	379344.60	3852257.01	46	59.74	150	Sixth highest over 5 years (the NAAQS is not to be exceeded more than once per year on average)
		2008	13.35	08/09/18/24	378665.00	3851720.00	46	59.35		
		2009	12.06	09/08/06/24	378739.55	3851768.56	46	58.06		
		2010	12.08	10/12/15/24	378810.99	3852298.80	46	58.08		
		2011	12.06	11/08/22/24	378665	3851620	46	58.06		
		2007 - 2011	14.04	07/08/03/24	378765.00	3851620.00	46	60.04		
$PM_{2.5}$	24-hour	2007	6.62	--	378852.62	3852323.27	18.5	25.12	35	Average of the eighth highest (98'th percentile) from each year
		2008	5.92	--	378810.99	3852298.80	18.5	24.42		
		2009	6.06	--	378690.48	3851769.45	18.5	24.56		
		2010	5.65	--	378739.55	3851768.56	18.5	24.15		
		2011	5.67	--	378690.48	3851769.45	18.5	24.17		
		2007 - 2011	5.68	--	378852.6	3852323.27	18.5	24.18		
	Annual	2007	1.94	--	378852.62	3852323.27	9.65	11.59	12	Average of the highest from each year
		2008	1.66	--	378852.62	3852323.27	9.65	11.31		
		2009	1.62	--	379000.41	3852321.36	9.65	11.27		
		2010	1.61	--	379000.41	3852321.36	9.65	11.26		
		2011	1.86	--	379000.41	3852321.36	9.65	11.51		
		2007 - 2011	1.50	--	379000.41	3852321.36	9.65	11.15		
NO_2	1-hour	2007	103.36	--	378886.76	3851765.89	63.92	167.28	188	Average of the eighth highest (98'th percentile) maximum daily 1-hour concentration from each year
		2008	103.86	--	378935.83	3851765.00	63.92	167.78		
		2009	100.01	--	378935.83	3851765.00	63.92	163.93		
		2010	96.69	--	378886.76	3851765.89	63.92	160.61		
		2011	95.50	--	378886.76	3851765.89	63.92	159.42		
		2007 - 2011	98.25	--	378886.76	3851765.89	63.92	162.17		
	Annual	2007	6.19	--	378886.76	3851765.89	7.52	13.71	100	Average of the highest from each year
		2008	4.57	--	378886.76	3851765.89	7.52	12.09		
		2009	4.96	--	378788.62	3851767.67	7.52	12.48		
		2010	5.48	--	378788.62	3851767.67	7.52	13.00		
		2011	5.02	--	378788.62	3851767.67	7.52	12.54		
		2007 - 2011	4.57	--	378788.62	3851767.67	7.52	12.09		
SO_2	1-hour	2007	72.18	07/08/10/09	378965.00	3851420.00	70.74	142.92	189	99'th percentile maximum daily 1-hour concentration averaged over 5-years
		2008	72.95	08/11/02/10	378065.00	3851120.00	70.74	143.69		
		2009	79.52	09/02/11/11	379965.00	3852220.00	70.74	150.26		
		2010	80.97	10/01/21/16	380065.00	3852120.00	70.74	151.71		
		2011	74.38	11/03/23/13	379965.00	3852120.00	70.74	145.12		
		2007 - 2011	76.00	--	--	--	70.74	146.74		
	3-hour	2007	66.24	07/08/11/12	378865.00	3851420.00	70.74	136.98	1,300	Highest of the second high from each of the 5 years
		2008	61.77	08/07/17/12	378765.00	3852720.00	70.74	132.51		
		2009	63.13	09/10/19/12	379165.00	3852620.00	70.74	133.87		
		2010	65.68	10/09/06/15	379065.00	3852620.00	70.74	136.42		
		2011	64.06	11/10/25/15	379265.00	3852620.00	70.74	134.80		
		2007 - 2011	66.24	07/08/11/12	378865.00	3851420.00	70.74	136.98		
	24-hour	2007	24.84	07/07/16/24	378965.00	3852720.00	18.34	43.18	365	Highest of the second high from each of the 5 years
		2008	24.93	08/06/07/24	379065.00	3852720.00	18.34	43.27		
		2009	25.46	09/06/20/24	379465.00	3851620.00	18.34	43.80		
		2010	24.46	10/07/03/24	379165.00	3852820.00	18.34	42.80		
		2011	23.30	11041924	379465.00	3852920.00	18.34	41.64		
		2007 - 2011	25.46	09/06/20/24	379465.00	3851620.00	18.34	43.80		
	Annual	2007	4.69	--	378965.00	3852720.00	5.66	10.35	80	Highest of the 5 years
		2008	3.32	--	378865.00	3852920.00	5.66	8.98		
		2009	3.39	--	379365.00	3852820.00	5.66	9.05		
		2010	4.03	--	379265.00	3852720.00	5.66	9.69		
		2011	3.91	--	379365.00	3852820.00	5.66	9.57		
		2007 - 2011	--	--	--	--	--	--		
CO	1-hour	2007	115.48	07/02/08/19	378886.76	3851765.89	1482	1597.48	40,000	Highest of the second high from each of the 5 years
		2008	116.30	08/01/12/21	378886.76	3851765.89	1482	1598.30		
		2009	112.48	09/11/04/24	378935.83	3851765.00	1482	1594.48		
		2010	113.72	10/12/24/22	378886.76	3851765.89	1482	1595.72		
		2011	113.98	11/12/17/06	378935.83	3851765.00	1482	1595.98		
		2007 - 2011	117.16	09/02/23/07	378935.83	3851765.00	1482	1599.16		
	8-Hour	2007	53.64	07/10/13/08	378886.76	3851765.89	1140	1193.64	10,000	Highest of the second high from each of the 5 years
		2008	61.33	08/03/06/08	378886.76	3851765.89	1140	1201.33		
		2009	46.31	09/09/30/08	378788.62	3851767.67	1140	1186.31		
		2010	43.64	10/11/28/08	378739.55	3851768.56	1140	1183.64		
		2011	48.58	11/03/03/08	378788.62	3851767.67	1140	1188.58		
		2007 - 2011	61.33	08/03/06/08	378886.76	3851765.89	1140	1201.33		

Table 6-1a
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Endangered Species in the State of Mississippi

Summary of Animals Listings

Animal species listed in this state and that occur in this state (30 species)

Status	Species Name
E	Bat, Gray Entire (Myotis grisescens)
E	Bat, Indiana Entire (Myotis sodalis)
T	Bear, Louisiana black Entire (Ursus americanus luteolus)
E	Clubshell, black Entire (Pleurobema curtum)
E	Clubshell, ovate (Pleurobema perovatum)
E	Clubshell, southern (Pleurobema decisum)
E	Combshell, Cumberlandian Entire Range; Except where listed as Experimental Populations (Epioblasma brevidens)
E	Combshell, southern Entire (Epioblasma penita)
E	Crane, Mississippi sandhill Entire (Grus canadensis pulla)
T	Darter, bayou Entire (Etheostoma rubrum)
E	Frog, Mississippi gopher Entire (Rana capito sevosa)
T	Heelsplitter, Alabama (=inflated) Entire (Potamilus inflatus)
E	Manatee, West Indian Entire (Trichechus manatus)
T	Moccasinshell, Alabama (Medionidus acutissimus)
E	Mussel, sheepnose (Plethobasus cyphyus)
E	Mussel, snuffbox (Pleurobema marshalli)
E	Pigtoe, flat (Pleurobema marshalli)
E	Pocketbook, fat Entire (Potamilus capax)
T	Sea turtle, green except where endangered (Chelonia mydas)
E	Sea turtle, hawksbill Entire (Eretmochelys imbricata)
E	Sea turtle, Kemp's ridley Entire (Lepidochelys kempii)
E	Sea turtle, leatherback Entire (Dermochelys coriacea)
E	Stirrupshell Entire (Quadrula stapes)
T	Sturgeon, gulf Entire (Acipenser oxyrinchus desotoi)
E	Sturgeon, pallid Entire (Scaphirhynchus albus)
E	Tern, least interior pop. (Sterna antillarum)
T	Tortoise, gopher W of Mobile/Tombigbee Rs. (Gopherus polyphemus)
T	Turtle, ringed map Entire (Graptemys oculifera)
T	Turtle, yellow-blotched map Entire (Graptemys flavimaculata)
E	Whale, finback Entire (Balaenoptera physalus)
E	Whale, humpback Entire (Megaptera novaeangliae)
E	Woodpecker, red-cockaded Entire (Picoides borealis)

Animal species listed in this state that do not occur in this state (7 species)

Status	Species Name
E	Beetle, American burying Entire (Nicrophorus americanus)
E	Panther, Florida U.S.A. (LA and AR east to SC and FL) (Puma (=Felis)
E	Pigtoe, heavy Entire (Pleurobema taitianum)
T	Plover, piping except Great Lakes watershed (Charadrius melodus)
T	Snake, eastern indigo Entire (Drymarchon corais couperi)
E	Sturgeon, Alabama (Scaphirhynchus suttkusi)
E	Wolf, gray U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, KS, KY, LA, M MS, NC, NE, NH, NJ, NV, NY, OK, PA, RI, SC, TN, VA, VT and WV; tho NM, and TX not included in an experimental population; and portic OH, OR, SD, UT, and WA. Mexico . (Canis lupus)

Animal listed species occurring in this state that are not listed in this state (5

Status	Species Name
E	Butterfly, Mitchell's satyr (Neonympha mitchellii mitchellii)
E	Plover, piping Great Lakes watershed (Charadrius melodus)
E	Sawfish, smalltooth (Pristis pectinata)
E	Stork, wood AL, FL, GA, SC (Mycteria americana)
E	Turtle, Alabama red-belly Entire (Pseudemys alabamensis)

Summary of Plant Listings

Plant species listed in this state and that occur in this state (4 species)

Status	Species Name
E	Chaffseed, American (Schwalbea americana)
E	Pondberry (Lindera melissifolia)
T	Potato-bean, Price's (Apios priceana)
E	Quillwort, Louisiana (Isoetes louisianensis)

Notes:
Taken from U.S. Fish and Wildlife Services - Species Report.
http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=MS&s8fid=112761032792&s8fid=112762573902

This report shows the listed species associated in some way with this state.
This list does not include experimental populations and similarity of appearance listings.
This list includes non-nesting sea turtles and whales in State/Territory coastal waters.
This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.

E = Endangered; T = Threatened

Table 6-1b
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnsville, MS
List of Endangered Species in Tishomingo County, MS

Group	Species Name	Status	Lead Office	Recovery Plan N
Clams	Cumberlandian Combshell (Epioblasma brevidens)	Endangered	Tennessee Ecological Services Field Office	Cumberland and Tenn Mussels (5 spp
Clams	Slabside Pearlymussel (Lexingtonia dolabelloides)	Proposed Endangered	Asheville Ecological Services Field Office	--
Clams	Rabbitsfoot (Quadrula cylindrica cylindrica)	Proposed Threatened	Arkansas Ecological Services Field Office	--
Insects	Mitchell's Satyr Butterfly (Neonympha mitchellii mitchellii)	Endangered	East Lansing Ecological Services Field Office	Mitchell's Satyr Bu
Mammals	Gray Bat (Myotis grisescens)	Endangered	Columbia Ecological Services Field Office	Gray Bat

Notes:
Taken from U.S. Fish and Wildlife Services - Species Report by County.
http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=28141

Endangered Species.xlsx

Table 7-1
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnville, MS
Proposed Permit Conditions - Part II - Emission Point Descriptions

Emission Point	Description
AA-000	**Silicon Manufacturing and Silicon Purification Plant**
AA-100	**Raw Material Receiving, Handling and Storage Operations**
AA-101	Material Handling and Transfer to and from Coal Storage Pile with a material throughput rate of 105,120 tons/yr
AA-101a	Conveyance of Coal To Charging Storage Silo equipped with a common baghouse or a series of smaller baghouses with a total flow rate of approximately 120,000 acfm
AA-102	Material Handling and Transfer to and from Wood Storage Pile with a material throughput rate of 212,763 tons/yr
AA-102a	Conveyance of Wood To Charging Storage Silo equipped with a common baghouse or a series of smaller baghouses with a total flow rate of approximately 120,000 acfm
AA-103	Material Handling and Transfer to and from Quartz Storage Pile with a material throughput rate of 212,763 tons/yr
AA-103a	Conveyance of Quartz To Charging Storage Silo equipped with a common baghouse or a series of smaller baghouses with a total flow rate of approximately 120,000 acfm
AA-104	Material Handling and Transfer of Limestone with a material throughput rate of 183 tons/yr
AA-105	Storage Pile Processing (i.e., Bulldozing)
AA-106	Wind Erosion on Coal, Wood and Quartz Storage Piles
AA-200	**Silicon Manufacturing Plant**
AA-201	Four (4) Submerged Arc Furnaces (SAF) each equipped with a baghouse with a flow rate of approximately 125,000 acfm. The SAF will have the following approximate raw material feed rates and silicon production rates: <u>Raw Material Feed Rates:</u> - Coal - 3.4 tons/hr - Wood - 7.0 tons/hr - Quartz - 7.0 tons/hr - Flux - 0.1 tons/hr <u>Silicon Production Rates:</u> - Per SAF - 2.75 tons/hr, 21,024 tons/yr - Total for 4 SAF - 11.0 tons/hr; 84,096 tons/yr
AA-201a	Casting Frames (One per SAF) <u>Silicon Production Rates:</u> - Per Casting Frame - 2.75 tons/hr, 21,024 tons/yr - Total for 4 Casting Frames - 11.0 tons/hr; 84,096 tons/yr
AA-203	Four (4) Natural Gas-Fired Ladle Preheaters (one per each SAF) rated at 10.0 MMBtu/hr each
AA-300	**Product Refinement and Handling**
AA-301	Product Refinement and Handling equipped with common baghouse or a series of smaller baghouses with a total flow rate of approximately 60,000 acfm
AA-400	**Other Plantwide Operations and Activities**
AA-401	One (1) Oxygen Vertical Storage Tank and One (1) Diesel Storage Tank
AA-402	Plantwide Fugitive Emissions from Roadways
AA-402a	Plantwide Fugitive Emissions from Transport of Raw Materials (Material Storage Piles to SAF Charging Building)
AA-403	Slag Handling and Storage
AA-404	Silica Fume Silos
AA-405	Facility-Wide Miscellaneous Operations Subject to APC-S-6
AA-500	**Emergency Support Equipment**
AA-501	One (1) Diesel-Fired Emergency Generator rated at 670 HP

Table 7-2
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnville, MS
Proposed Permit Conditions - Part III - Emission Point Specific Limitations and Standards

AA-000 - Entire Facility			
AA-000 (Entire Facility)	PSD Construction Permit Issued Issuance Date	Silicon Production	84,096 tons/yr
		Natural Gas Combustion	350,000 MMBtu/yr
		NO_x	1,906.2 tons/yr
		CO	1,444.3 tons/yr
		SO_2	2,170.1 tons/yr
		VOC	93.5 tons/yr
		PM_{10}	81.8 tons/yr
		$PM_{2.5}$	73.3 tons/yr
		HAP	10 tons/yr (Individual) / 25 tons/yr (Total)
AA-100 - Raw Material Receiving, Handling and Storage Operations			
AA-100 (Raw Material Receiving, Handling and Storage Operations)	PSD Construction Permit Issued Issuance Date	Material Throughput	AA-101 (Coal) - 105,120 tpy AA-102 (Wood) - 212,763 tpy AA-103 (Quartz) - 212,763 tpy AA-104 (Limestone) - 183 tpy
		$PM_{10}/PM_{2.5}$	BACT Material Transfer and Handling (AA-101, AA-102, AA-103) • Development of a fugitive dust control plan to minimize PM emissions; and • No emission limit is being proposed for these operations since there is no available test method to determine the PM/PM10/PM2.5 emission rate Material and Product Handling Operations (AA-101a, AA-102a, AA-103a) - Baghouse for PM control; and - A $PM_{10}/PM_{2.5}$ limitation of 0.003 gr/dscf.* *It should be noted that MS Silicon is voluntarily designing the baghouse to meet 0.0015 gr/dscf to minimize the potential impact on PM10/PM2.5 air quality. This emission rate does not constitute BACT
AA-102b (Wood Chipper)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	BACT: No emission limit is being proposed for this operation since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate - Limited hours of operation; and - Operation of the wood chipper with an enclosure or similar that will minimize fugitive dust emissions.
AA-105 (Storage Pile Processing (i.e., Bulldozing)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	BACT: - No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate - Development of fugitive dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required.
AA-106 (Wind Erosion)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	BACT: -Implementation of a fugitive dust control plan. Visible emissions from the storage piles shall be controlled by the application of water, other dust suppressants or the use of wind screens, as needed - No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate
AA-200 - Silicon Manufacturing Plant			
AA-201 (Submerged Arc Furnaces)	PSD Construction Permit Issued Issuance Date 40 CFR 60, Subpart Z – Ferroalloy Production Facilities	NO_x	BACT: 45 lbs/ton silicon produced (30-day averaging period)
		CO	BACT: 34 lbs/ton silicon produced (30-day averaging period) - Good combustion and operating practices; and - Utilization of a semi-enclosed SAF design.
			40 CFR 60, Subpart Z - Less than 20 volume percent on a dry basis
		$PM_{10}/PM_{2.5}$	BACT: Use of fabric filter control. $PM_{10}/PM_{2.5}$ - 0.005 gr/dscf 40 CFR 60, Subpart Z - 0.45 kg/MW-hr (0.99 lb/MW-hr)
		SO_2	BACT: 52 lbs/ton silicon produced (30-day averaging period) - Utilization of low sulfur content material, where technically feasible
		VOC	BACT: 2.4 lbs/ton silicon produced (30-day averaging period) - Good operating practices
		CO_2e	BACT: 381,866 tons/year 1. Utilization of a new generation furnace (i.e., semi-enclosed SAF design). 2. Good operation and maintenance to improve energy efficiency.
		Opacity	40 CFR 60, Subpart Z - 15% from control device

Table 7-2
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnville, MS
Proposed Permit Conditions - Part III - Emission Point Specific Limitations and Standards

AA-201a (Casting Frames)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	BACT: -No emission limit is being proposed since there is no formal method for quantifying emissions from this type of indoor operation - Best management practices
AA-202 (Natural Gas-Fired Ladle Preheaters)	PSD Construction Permit Issued Issuance Date	NO_x	BACT: NO_x - 0.08 lb/MMBtu 1. Low NO_x or equivalent burners/technology; 2. Combustion of clean fuel; and 3. Good combustion practices.
		CO	BACT: CO - 0.0840 lb/MMBtu 1. Combustion of natural gas; and 2. Good combustion practices.
		SO_2	BACT: SO_2 - 0.0006 lbs/MMBtu 1. Combustion of clean fuel; and 2. Good combustion practices.
		VOC	BACT: VOC - 0.0055 lb/MMBtu (AP-42 emission factor) 1. Combustion of natural gas; and 2. Good combustion practices.
		$PM_{10}/PM_{2.5}$	BACT: Total PM - 0.0076 lb/MMBtu (AP-42 Emission Factor) 1. Combustion of Natural Gas Only. 2. Good Combustion Practices
		GHG	BACT - CO_2 – 117 lb/MMBtu - Methane – 0.0022 lb/MMBtu - N_2O – 0.0002 lb/MMBtu Control techniques to be implemented to meet these emission limitations will be: 1. Good combustion practices; 2. Combustion of natural gas only; 3. Selection of the most energy efficient burner design based on engineering selection process; and 4. Periodic maintenance.
AA-300 - Product Refinement & Handling			
AA-301 (Product Refinement & Handling)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	Material and Product Handling Operations (AA-301) BACT: - Baghouse for PM control; and - A $PM_{10}/PM_{2.5}$ limitation of 0.003 gr/dscf.* *It should be noted that MS Silicon is voluntarily designing the baghouse to meet 0.0015 gr/dscf to minimize the potential impact on PM10/PM2.5 air quality. This emission rate does not constitute BACT
AA-400 - Other Plantwide Operations and Activities			
AA-401 (Storage Tanks)	PSD Construction Permit Issued Issuance Date	--	--
AA-402 (Roadway Fugitives)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	BACT: - No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate. - Development of dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required.
AA-402a (Plantwide Fugitive Emissions from Transport of Raw Materials)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	BACT: - No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate. - Development of dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required.
AA-403 (Slag Handling and Storage)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	Material and Product Handling Operations (AA-403) BACT: - Baghouse for PM control; and - A $PM_{10}/PM_{2.5}$ limitation of 0.003 gr/dscf.* *It should be noted that MS Silicon is voluntarily designing the baghouse to meet 0.0015 gr/dscf to minimize the potential impact on PM10/PM2.5 air quality. This emission rate does not constitute BACT
AA-404 (Silica Fume Silos)	PSD Construction Permit Issued Issuance Date	$PM_{10}/PM_{2.5}$	BACT: - Bin Vent Filter for PM control; and - A $PM_{10}/PM_{2.5}$ limitation of 0.01 gr/dscf.
AA-405 (Facility-Wide Miscellaneous Operations)	PSD Construction Permit Issued Issuance Date	--	--
AA-500 - Emergency Support Equipment			
AA-501 (Diesel-Fired Emergency Generators)	40 CFR 60, Subpart IIII and Subpart A 40 CFR 63, Subpart ZZZZ and Subpart A	Applicability	40 CFR 60, Subpart IIII - Stationary Compression Ignition Internal Combustion Engines 40 CFR 63, Subpart ZZZZ - Stationary Reciprocating Internal Combustion Engines BACT: Compliance with NSPS IIII, good combustion/operating practices and use of ULSD.

Table 7-3
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnville, MS
Proposed Permit Conditions - Part IV - Emission Point Specific Compliance / Performance Requirements

Emission Point	Pollutant / Parameter Monitored	Compliance Requirement	Applicable Requirement
AA-000 - Entire Facility			
AA - 000 (Entire Facility)	NO_x	Determine the Emission Rate for each consecutive 12-month period	PSD Construction Permit Issued Issuance Date
	CO		
	SO_2		
	VOC		
	$PM_{10}/PM_{2.5}$		
	Silicon Production	Determine the Production for each consecutive 12-month period	PSD Construction Permit Issued Issuance Date
	Opacity	Demonstrate Compliance utilizing EPA Method 22 or EPA Method 9	PSD Construction Permit Issued Issuance Date
	Pre-Test Conference	30 days prior to performance testing for any emission point	PSD Construction Permit Issued Issuance Date
	Control Equipment	Regular Maintenance shall be maintained and kept in log form	PSD Construction Permit Issued Issuance Date
AA-100 - Raw Material Receiving, Handling and Storage Operations			
AA-101, AA-102, AA-103 & AA-104 (Raw Material Receiving, Handling and Storage Operations)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-101a, AA-102a, AA-103a (Conveyance of Raw Materials to Charging Storage Silos)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-105 (Storage Pile Processing)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-106 (Wind Erosion)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-200 - Silicon Manufacturing Plant			
AA-201 (Submerged Arc Furnaces)	NO_x	Installation and Operation of CEMS deadline (Continuous Emission Monitoring System)	PSD Construction Permit Issued Issuance Date
	CO		
	SO_2		
AA-201 (Submerged Arc Furnaces)	NO_x	Initial Performance Testing for demonstrating compliance with BACT and Permit Limits	PSD Construction Permit Issued Issuance Date
	CO		
	SO_2		
	VOC		
AA-201 (Submerged Arc Furnaces)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-201 (Submerged Arc Furnaces)	Performance Test	Compliance with related permit condition	40 CFR 60, Subpart Z – Ferroalloy Production Facilities
AA-201 (Submerged Arc Furnaces)	Emissions Monitoring - Opacity	60.264 - Install, calibrate, maintain and operate a continuous monitoring system for measurement of the opacity of emissions discharged into the atmosphere from the control device(s).	40 CFR 60, Subpart Z – Ferroalloy Production Facilities
	Emissions Monitoring - Furnace Power Input	20.265(b) - Install, calibrate, maintain, and operate a device to measure and continuously record the furnace power input.	
	Emissions Monitoring - Volumetric Flow Rate	20.265(c) - Install, calibrate, and maintain a monitoring device that continuously measures and records the volumetric flow rate through each separately ducted hood of the capture system.	
AA-201a (Casting Frames)	$PM_{10}/PM_{2.5}$	Utilize Best Management Pracitces for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-202 (Natural Gas-Fired Ladle Preheaters)	NO_x	Utilize Good Combustion Practices and Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
	CO		
	SO_2		
	$PM_{10}/PM_{2.5}$		
	CO_2e		

Table 7-3
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnville, MS
Proposed Permit Conditions - Part IV - Emission Point Specific Compliance / Performance Requirements

Emission Point	Pollutant / Parameter Monitored	Compliance Requirements	Monitoring Requirements
AA-300 - Product Refinement & Handling			
AA-300 (Product Refinement & Handling)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-400 - Other Plantwide Operations and Activities			
AA-402 (Roadway Fugitives)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-402a (Plantwide Fugitive Emissions from Transport of Raw Materials)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-403 (Slag Handling and Storage)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-404 (Silica Fume Silos)	$PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date
AA-403 (Facility-Wide Miscellaneous Operations)	--	--	PSD Construction Permit Issued Issuance Date
AA-500 - Emergency Support Equipment			
AA-501 (Diesel-Fired Emergency Generators)	NO_x, CO, SO_2, VOC, $PM_{10}/PM_{2.5}$	Implement Maintenance Guidelines for demonstrating compliance with BACT	PSD Construction Permit Issued Issuance Date

Table 7-4
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnville, MS
Proposed Permit Conditions - Part V - Emission Point Recordkeeping / Reporting Requirements

[illegible]	[illegible]	[illegible]	[illegible]
AA-000 - Entire Facility			
AA-000 - Entire Facility	Certificate of Construction	Report in writing the effective date of start-up no later than 10 days following commencement	PSD Construction Permit Issued Issuance Date
	Emission Limitations	Maintain all records necessary to demonstrate compliance	PSD Construction Permit Issued Issuance Date
	Performance Testing	Submit results no later than 60 days from actual test	PSD Construction Permit Issued Issuance Date
	Deviations	Reported within 5 days from the time the deviation began	PSD Construction Permit Issued Issuance Date
	NO_x	Semi-Annual Report of Facility Wide Emission Rate in tons per year as determined for each consecutive 12-month period	PSD Construction Permit Issued Issuance Date
	CO		PSD Construction Permit Issued Issuance Date
	SO_2		PSD Construction Permit Issued Issuance Date
	VOC		PSD Construction Permit Issued Issuance Date
	$PM_{10}/PM_{2.5}$		PSD Construction Permit Issued Issuance Date
	GHGs	Annual GHG Emission Report in metric tons per year as determined for each consecutive 12-month period	PSD Construction Permit Issued Issuance Date
	Silicon Production	Semi-Annual Report of Production	PSD Construction Permit Issued Issuance Date
	Natural Gas Combustion	Semi-Annual Report of Usage Rate	PSD Construction Permit Issued Issuance Date
	Other	None	MDEQ Regulations, APC-S-2
AA-100 - Raw Material Receiving, Handling and Storage Operations			
AA-100 - Raw Material Receiving, Handling and Storage Operations	$PM_{10}/PM_{2.5}$	Development of dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required. Monthly Recordkeeping of Raw Material Throughputs	PSD Construction Permit Issued Issuance Date
AA-200 - Silicon Manufacturing Plant			
AA-201 (Submerged Arc Furnaces)	40 CFR 60, Subpart Z – Ferroalloy Production Facilities	Notification of Compliance Status	40 CFR 60, Subpart Z – Ferroalloy Production Facilities
	40 CFR 60, Subpart Z – Ferroalloy Production Facilities	60.265 - Maintain Daily Records of the following: (1) Product being produced. (2) Description of constituents of furnace charge, including the quantity, by weight. (3) Time and duration of each tapping period and the identification of material tapped (slag or product.) (4) All furnace power input data obtained under paragraph (b) of this section. (5) All flow rate data obtained under paragraph (c) of this section or all fan motor power consumption and pressure drop data obtained under paragraph (e) of this section.	40 CFR 60, Subpart Z – Ferroalloy Production Facilities
AA-202 (Natural Gas-Fired Ladle Preheaters)	Natural Gas	Usage on a Monthly Basis, Monitoring and Monthly Emissions	PSD Construction Permit Issued Issuance Date

Table 7-4
Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
Burnville, MS
Proposed Permit Conditions - Part V - Emission Point Recordkeeping / Reporting Requirements

Emission Point	Pollutant / Parameter Monitored	Recordkeeping / Reporting Requirement	Applicable Requirements
AA-400 - Other Plantwide Operations and Activities			
AA-402 (Roadway Fugitives)	$PM_{10}/PM_{2.5}$	Development of dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required. Monthly Recordkeeping of Emissions	PSD Construction Permit Issued Issuance Date
AA-402a (Plantwide Fugitive Emissions from Transport of Raw Materials)	$PM_{10}/PM_{2.5}$	Development of dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required. Monthly Recordkeeping of Emissions	PSD Construction Permit Issued Issuance Date
AA-403 (Slag Handling and Storage)	$PM_{10}/PM_{2.5}$	Monthly Recordkeeping of Emissions	PSD Construction Permit Issued Issuance Date
AA-404 (Silica Fume Silos)	$PM_{10}/PM_{2.5}$	Monthly Recordkeeping of Emissions	PSD Construction Permit Issued Issuance Date
AA-405 (Facility-Wide Miscellaneous Operations)	--	--	--
AA-500 - Emergency Support Equipment			
AA-501 (Diesel-Fired Emergency Generators)	Monitoring Requirements	Monitoring Requirements	40 CFR 60.4209
	Compliance	Monitoring for Demonstrating Compliance Requirements	40 CFR 60.4211(a), (b)(1), (c), and (e)
	NO_x, CO, SO_2, VOC, $PM_{10}/PM_{2.5}$	Monitoring and Monthly Recordkeeping of Emissions and Low Sulfur Fuel Oil	PSD Construction Permit Issued Issuance Date

PREVENTION OF SIGNIFICANT DETERIORATION AIR QUALITY ANALYSIS MISSISSIPPI SILICON LLC PROPOSED SILICON MANUFACTURING PLANT CLASS I IMPACTS FOR SIPSEY AND MINGO WILDERNESS AREAS

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By

Meteorological Solutions Inc.
Project No. 10131368

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EXECUTIVE SUMMARY

A Prevention of Significant Deterioration (PSD) Class I ambient air quality analysis was conducted for the emission sources associated with Mississippi Silicon, LLC proposed silicon manufacturing plant to be located in Tishomingo County, near the town of Burnsville, Mississippi. The air dispersion modeling analyses were conducted to evaluate the air quality impact on two Class I areas, Sipsey and Mingo Wilderness areas, which are located within a 300 kilometer radius of the proposed plant. The air modeling analyses evaluated the potential air quality impacts on the Sipsey and Mingo Wilderness areas and included the Class I Area Increment and Air Quality Related Values (AQRVs) which evaluated the Class I Significant Impact Levels (SILs), visibility impairment, and sulfate and nitrate deposition impacts.

To perform the Class I area analyses, the CALPUFF Modeling System (CALPUFF (Version 5.8), CALMET (Version 5.8), and CALPOST (Version 6.221)) which is the long range transport model recommended by the draft Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report - Revised (2010), was utilized. CALPUFF is a non-steady state Lagrangian Gaussian puff long-range transport model that includes algorithms for building downwash effects, as well as chemical transformations (important for visibility controlling pollutants), and wet/dry deposition. CALPUFF uses the wind fields generated by CALMET to make the transport and dispersion calculations.

CALMET, the meteorological preprocessor for CALPUFF, is a diagnostic meteorological model that produces three-dimensional wind and temperature fields and two-dimensional fields of other meteorological parameters. The Class I air dispersion modeling analysis was performed using the CALMET dataset which was developed through the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) Best Available Retrofit Technology (BART), commonly referred to as the VISTAS CALMET dataset.

The VISTAS CALMET dataset is available for 5 sub domains. The VISTAS CALMET dataset for Sub Domain 1 was utilized for the Sipsey Wilderness Area; sub Domain 3 was utilized for the Mingo Wilderness Area. The VISTAS CALMET dataset incorporated meteorological surface and upper air as well as precipitation stations which were provided to the CALMET model during processing. Monthly CALMET.DAT files were used for years 2001, 2002, and 2003. Ozone data were extracted using CalPro from a standard ozone dataset associated with the VISTAS CALMET dataset (Sub Domain 1 or 3).

Geophysical data such as terrain and land use is a necessary input to the CALMET model. The geophysical data utilized was included as part of the VISTAS CALMET dataset.

POSTUTIL (Version 1.56), a program that transforms particle size species to new species and produces the necessary concentration files that are then used by CALPOST for post-processing of results, was used for these analyses. The CALPOST model was used to calculate the concentration results for comparison to the modeling significance levels and the deposition flux for total sulfur and nitrogen. CALPOST was also used to carry out the visibility analysis. The CALPUFF modeling system switch settings and model options were based a combination of Interagency Workgroup on Air Quality Modeling (IWAQM) recommended switch settings and successive switch settings recommended in the Federal Land Managers (FLM) CALPUFF Reviewer's guide-FNL-20110523.

The air dispersion modeling analysis evaluated the potential impact of emissions (two submerged electric arc furnaces only) from the proposed silicon manufacturing plant. MS Silicon in discussions with the Mississippi Department of Environmental Quality (MDEQ) has committed to operating no more than two submerged arc furnaces at any given time. Emission data and source characteristic information for the proposed silicon manufacturing plant were provided by Kennedy/Jenks Consultants. Point, area, and volume sources were included in the model. Discrete receptors for Sipsey and Mingo Wilderness areas, downloaded from the National Park Service (NPS) web site at http://www.nature.nps.gov/air/maps/receptors/index.cfm were used to calculate air quality and visibility impacts.

The maximum concentrations of SO_2, NO_2, PM_{10}, and $PM_{2.5}$ at the Sipsey and Mingo Wilderness Areas were compared with Class I Significant Impact Levels (SILs). According to guidance, if maximum concentrations are below the SILs, then emissions from the facility are assumed to be insignificant and no further analysis is needed. Tables E-1 and E-2 present the results of the air dispersion modeling analysis for the Mississippi Silicon, LLC facility and compares the modeled concentrations at Sipsey and Mingo, respectively, to the Class I SILs. With the exception of three-hour and 24-hour SO_2 concentrations for 2001 and 2003, results indicate that all modeled concentrations are well below the SILs. For pollutant concentrations below the SIL, the emissions from the Mississippi Silicon, LLC facility are assumed to be insignificant which means that emissions from the proposed facility will not have the potential to cause or contribute to an exceedance of an ambient air quality standard or PSD increment. At this time the Mississippi Department of Environmental Quality (MDEQ) and FLM's have not required a cumulative increment analysis to be conducted.

Table E-1

CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Sipsey Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations ($\mu g/m^3$)			SIL Class I Significant Impact Levels ($\mu g/m^3$)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.8775	0.5986	**1.2454**	1.0	**124.5**
	3-hour (H2H)	0.6231	0.5672	0.9001	1.0	90.0
	24-hour (H1H)	**0.2371**	0.1958	**0.2551**	0.2	**127.5**
	24-hour (H2H)	0.1548	0.1947	**0.2235**	0.2	**111.7**
	Annual (H1H)	0.0074	0.0082	0.0104	0.1	10.4
NO_2	Annual (H1H)	0.0050	0.0058	0.0070	0.1	7.0
PM_{10}	24-hour (H1H)	0.0071	0.0046	0.0044	0.3	2.4
	24-hour (H2H)	0.0050	0.0031	0.0041	0.3	1.7
	Annual (H1H)	0.0002	0.0002	0.0002	0.2	0.11
$PM_{2.5}$	24-hour (H1H)	0.0139	0.0077	0.0081	0.07	19.8
	24-hour (H2H)	0.0074	0.0074	0.0072	0.07	10.62
	Annual (H1H)	0.0004	0.0003	0.0004	0.06	0.73

Table E-2

CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Mingo Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (µg /m3)			SIL Class I Significant Impact Levels (µg /m^3)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.0798	0.2387	0.1317	1.0	23.9
	3-hour (H2H)	0.0636	0.1173	0.0794	1.0	11.7
	24-hour (H1H)	0.0243	0.0563	0.0305	0.2	28.1
	24-hour (H2H)	0.0401	0.0313	0.0252	0.2	20.1
	Annual (H1H)	0.0006	0.0008	0.0008	0.1	0.85
NO_2	Annual (H1H)	0.0004	0.0002	0.0003	0.1	0.36
PM_{10}	24-hour (H1H)	0.0004	0.0011	0.0007	0.3	0.36
	24-hour (H2H)	0.0003	0.0006	0.0006	0.3	0.21
	Annual (H1H)	0.0000	0.0000	0.0000	0.2	0.01
$PM_{2.5}$	24-hour (H1H)	0.0012	0.0019	0.0020	0.07	2.9
	24-hour (H2H)	0.0010	0.0014	0.0019	0.07	2.7
	Annual (H1H)	0.0000	0.0000	0.0000	0.06	0.07

A visibility impairment analysis was conducted in order to determine if the Mississippi Silicon, LLC facility would have an adverse impact on visibility at the Sipsey and Mingo Wilderness Areas. The analysis was done using the CALPOST following the methods and options outlined under the FLAG 2010 guidance with MVISBK = 8 and the background light extinction based on the "cleanest 20%" days for each wilderness area. The visibility threshold is exceeded if the predicted change in light extinction exceeds 5% based on the 98th percentile (eighth highest day for a year) in any single year modeled. The CALPUFF/CALPOST visibility results for the Mississippi Silicon, LLC facility were compared to the "cleanest 20%" background and were found to be below the 5% (based on the 98th percentile calculation) for the cleanest 20% background condition. These results for Sipsey and Mingo Wilderness areas are presented in Tables E-3 and E-4, respectively.

Table E-3

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Sipsey Wilderness Area

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	3.03%	3.20%	2.35%	64.0
2	2.90%	2.97%	2.19%	59.4
3	2.60%	2.41%	2.07%	52.0
4	2.54%	1.69%	1.98%	50.8
5	2.41%	1.68%	1.95%	48.2
6	2.13%	1.61%	1.95%	42.6
7	1.97%	1.59%	1.64%	39.4
8	1.69%	1.41%	1.58%	33.8

Table E-4

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Mingo Wilderness Area

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	1.04%	0.46%	1.06%	21.2
2	0.55%	0.39%	0.99%	19.8
3	0.54%	0.37%	0.91%	18.2
4	0.52%	0.35%	0.70%	14
5	0.44%	0.29%	0.66%	13.2
6	0.37%	0.28%	0.51%	10.2
7	0.34%	0.25%	0.44%	8.8
8	0.30%	0.24%	0.34%	6.8

Total sulfur and total nitrogen deposition analyses were performed for Sipsey and Mingo Wilderness areas. For the deposition analysis, POSTUTIL was used to combine the wet and dry flux output files from CALPUFF and scale the contributions of SO_2, SO_4, NO_x, NO_3, and HNO_3 such that total nitrogen (N) and total sulfur (S) flux were contained in the same file. The model results were compared to the 0.01 kg/ha/year Deposition Analysis Threshold (DAT) developed by the NPS and the U.S. Fish and Wildlife Service (FWS) for the Eastern Class I Areas. The results of this analysis are provided in E-5 and E-6 for Sipsey and Mingo, respectively.

Table E-5

Sulfur and Nitrogen Deposition Flux Results for Sipsey Wilderness Area

Pollutant	Total Modeled Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0068	0.0087	0.0087	0.01	87.1
Nitrogen (N)	0.0028	0.0036	0.0037	0.005	73.1

Table E-6

Sulfur and Nitrogen Deposition Flux Results for Mingo Wilderness Area

Pollutant	Total Modeled Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0010	0.0010	0.0016	0.01	16.4
Nitrogen (N)	0.0005	0.0004	0.0007	0.005	14.8

PREVENTION OF SIGNIFICANT DETERIORATION AIR QUALITY ANALYSIS
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Appendix

A CALPUFF Control Parameters and Technical Options

PREVENTION OF SIGNIFICANT DETERIORATION AIR QUALITY ANALYSIS MISSISSIPPI SILICON LLC PROPOSED SILICON MANUFACTURING PLANT CLASS I IMPACTS FOR SIPSEY AND MINGO WILDERNESS AREAS

1.0 INTRODUCTION

A Prevention of Significant Deterioration (PSD) Class I ambient air quality analysis was conducted for the emission sources associated with Mississippi Silicon, LLC proposed silicon manufacturing plant to be located in Tishomingo County, near the town of Burnsville, Mississippi. The air dispersion modeling analyses were conducted to evaluate the air quality impact on two Class I areas, Sipsey and Mingo Wilderness areas, which are located within a 300 kilometer radius of the proposed plant. The air modeling analyses evaluated the potential air quality impacts on the Sipsey and Mingo Wilderness areas and included the Class I Area Increment and Air Quality Related Values (AQRVs) which evaluated the Class I Significant Impact Levels (SILs), visibility impairment, and sulfate and nitrate deposition impacts. To perform the Class I area analyses, the CALPUFF Modeling System (CALPUFF (Version 5.8), CALMET (Version 5.8), and CALPOST (Version 6.221)) which is the long range transport model recommended by the draft Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report—Revised (2010), was utilized.

1.1 Facility Description

The proposed silicon manufacturing plant will be located in Tishomingo County, near the town of Burnsville, Mississippi. Tishomingo County is in attainment for all pollutants. The proposed project will result in emission increases of all criteria pollutants above the Prevention of Significant Deterioration (PSD) threshold limits.

Therefore, several criteria pollutants were subject to PSD review and thus a subsequent Class I modeling analysis was performed to assess the impacts of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter with aerodynamic diameters of 10 or 2.5 microns of less (PM_{10} and $PM_{2.5}$), and volatile organic compounds (VOC) from the proposed project on nearby PSD Class I areas. This document describes the procedures that were used to evaluate the potential air quality impacts due to the proposed project's operations at Sipsey and Mingo Wilderness areas. Figure 1.1 presents a map showing the location of the proposed facility. Figure 1.2 shows the location of the proposed plant and it's relation to the nearby PSD Class I areas. The Mingo and Sipsey Wilderness Areas are located approximately 293 kilometers and 93 kilometers from the proposed MS Silicon facility, respectively.

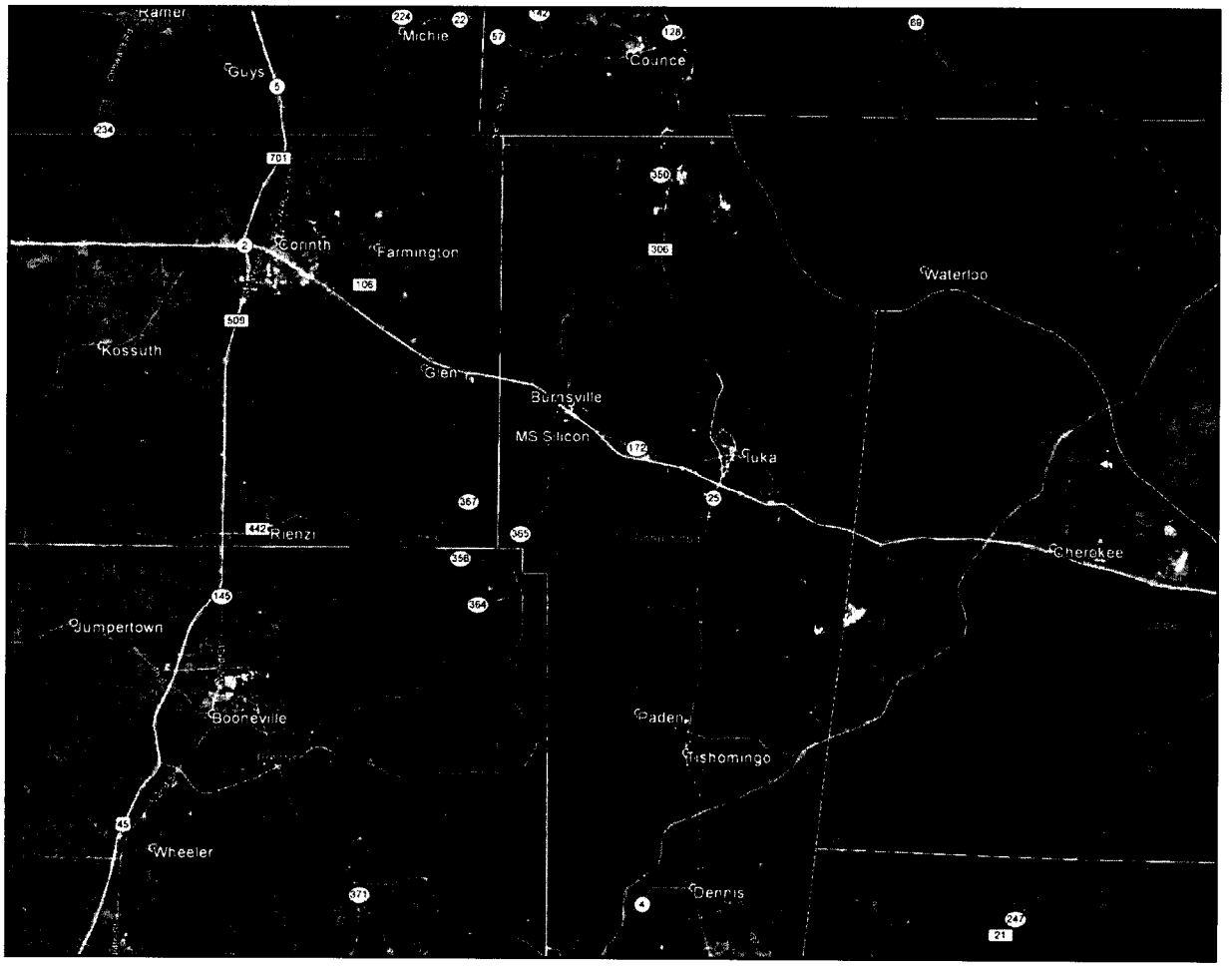

Figure 1.1 Location of Proposed Mississippi Silicon Facility

Figure 1.2 Location of Proposed Mississippi Silicon Facility Relative to Class I Areas

2.0 PROJECT DESCRIPTION

The proposed silicon manufacturing plant will be located in Tishomingo County, near the town of Burnsville, Mississippi. The proposed silicon manufacturing plant will be constructed in two (2) phases. After completion of both phases, the manufacturing plant will utilize four (4) semi-enclosed submerged arc furnaces (SAF) with a capacity of 2.75 tons/hr each (~45 MVA) to produce approximately 84,096 tons per year of 98-99% pure silicon metal.

2.1 Project Emissions

PSD review applies to specific pollutants for which a project is considered major and the project area is designated as attainment or unclassified with respect to the NAAQS. For a new facility to be subject to PSD review, the project's potential to emit (PTE) must exceed the PSD major source thresholds, which are:

- 100 tpy if the source is one of the 28 named source categories, or
- 250 tpy for all other sources.

The silicon manufacturing plant is not a named source category; thus, the applicable PSD threshold is 250 tpy. Once it has been determined that a pollutant exceeds the PSD major source threshold, additional pollutants will be subject to PSD review if their potential to emit (PTE) exceeds the PSD Significant Emission Rates. Table 2-1 compares the MS Silicon annual PTE at the conclusion of Phase II with the PSD significant emission rates. As shown in the Table 2-1, the MS Silicon facility's PTE is estimated to be greater than the PSD significant emission rates for these PSD pollutants. PSD review and approval is therefore required for these pollutants.

The project PTE provided below reflects operation of four (4) submerged arc furnaces. Since submission of the initial application, MS Silicon has committed to operating no more than two (2) furnaces at any given time. Subsequently, the project emissions provided in Table 2-1 are a conservative estimate of the PTE emission rates.

Table 2-1

Comparison of Project Annual PTE Emissions

to PSD Significant Emission Rates

Pollutant	**PSD Significant Emission Rate (TPY)**	**Project PTE (TPY)**
Sulfur Dioxide (SO_2)	40	2,170.1
Nitrogen Dioxide (NO_2)	40	1,906.2
Carbon Monoxide (CO)	100	1,444.3
Particulate Matter (PM)	25	104.1
Particulate Matter (PM_{10})	15	81.6
Particulate Matter ($PM_{2.5}$)	10	73.1
Volatile Organic Compounds (VOC)	40	93.5

In addition to the analysis of PSD Class I Increment compliance, the PSD Class I analysis must also address impacts to special attributes of a Class I area that deterioration of air quality may adversely affect such as the contribution to regional haze, and impacts on acid deposition. Such attributes are referred to as Air Quality Related Values (AQRVs) and are specified by the Federal Land Manager (FLM) of the respective Class I area.

2.2 Annual Emissions/Distance (Q/D) Screening Analysis

In the FLAG 2010 Phase 1 report, FLMs developed a consistent and objective approach to evaluate air pollution effects on public AQRVs in Class I areas, including a process to identify those resources and any potential adverse impacts. FLAG also provides State permitting authorities and potential permit applicants consistency on how to assess the impacts of new and existing sources on AQRVs in Class I areas.

FLAG 2010 presents a screening method that would exempt a proposed major source from performing visibility and deposition analyses at Class I areas if the screening criteria are met. This AQRV screening criteria is based on EPA's Best Available Retrofit Technology (BART) guidelines. According to FLAG 2010, for sources that are located more than 50 kilometers away from a Class I area, if the ratio of total SO_2, NO_x, PM_{10}, and H_2SO_4 annual emissions (in tons per year) over the distance (in kilometers) from the proposed source to nearest Class I area (Q/D) is less than 10, then it is presumed that there will be no adverse effects on AQRV's at the Class I area being reviewed.

As seen from Table 2-1, the total annual emission estimates for SO_2, NO_x, PM_{10}, and H_2SO_4 provided by Kennedy/Jenks Consultants for the proposed MS Silicon facility are 4157.9 tons per year. The Q/D ratios, based on total annual emissions and the distance of the Mingo and Sipsey Wilderness areas were calculated to be 14.2 and 44.7, respectively. Thus, AQRV analyses for visibility and deposition were required to be performed and the results of which are presented in Section 4.0. However, it should be noted that the modeling being performed is in support of MS Silicon's commitment to operate no more than two submerged arc furnaces at any given time. The two submerged arc furnaces being modeled are SAF1-1 and SAF-2, the total annual emission estimate being modeled is approximately 2,096.4 tons per year.

3.0 AIR QUALITY IMPACT ANALYSES

This section presents the dispersion model setup and input data used to analyze the impacts of the MS Silicon facility on the PSD Class I increment and AQRVs at the Sipsey and Mingo Wilderness Areas.

3.1 Model Selection

For the far-field PSD Class I area analyses, the current USEPA-approved version of the CALPUFF Modeling System (CALPUFF (Version 5.8, Level 070623), CALMET (Version 5.8, Level 070623), POSTUTIL (Version 1.56, Level 070627) and CALPOST (Version 6.221, Level 080724)) was utilized. The CALPUFF modeling system is the long range transport model recommended by the FLAG 2010.

CALPUFF is a non-steady state Lagrangian Gaussian puff long-range transport model that simulates the effects of time and space-varying meteorological conditions on pollution transport, transformation, and removal. CALPUFF can be applied on scales of tens to hundreds of kilometers and it includes algorithms to calculate long range effects such as pollutant removal due to dry deposition or wet scavenging, chemical transformation, and visibility effects of particulate matter concentrations.

The CALPUFF modeling system has three main components which were utilized for the analyses. These components are CALMET (a diagnostic 3-D meteorological model), CALPUFF (the transport and dispersion model), and CALPOST (a post-processing package). CALPUFF uses the wind fields generated by CALMET to make the transport and dispersion calculations.

3.2 CALMET Input

CALMET, the meteorological preprocessor for CALPUFF, is a diagnostic meteorological model that produces three-dimensional wind and temperature fields and two-dimensional fields of other meteorological parameters. The Class I air dispersion modeling analysis was performed using the CALMET dataset which was developed through the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) Best Available Retrofit Technology (BART), commonly referred to as the VISTAS CALMET dataset. The VISTAS CALMET dataset is available for 5 sub domains. The VISTAS CALMET dataset for Sub Domain 1 was utilized for the Sipsey Wilderness Area; sub Domain 3 was utilized for the Mingo Wilderness Area.

The VISTAS CALMET dataset incorporated meteorological surface and upper air as well as precipitation stations which were provided to the CALMET model during processing. Monthly CALMET.DAT files were used for years 2001, 2002, and 2003. Ozone data were extracted using CalPro from a standard ozone dataset associated with the VISTAS CALMET dataset (Sub Domain 1 or 3).

Lambert Conformal map projection was used to define the boundaries of the VISTAS CALMET domains to accommodate the earth's curvature. Within the modeling domains, a four kilometer computational grid spacing with ten vertical layers was developed. Each modeling domain had at least a 50 kilometer buffer zone around the Class I area to capture recirculation effects. The puffs are tracked until they cross outside the boundary. Table 3-1 presents the map projection and grid control parameters for each of the VISTAS sub-domains. Figure 3.1 presents a map showing the location of the MS Silicon facility, Sipsey and Mingo Wilderness areas, and the domain boundaries for the VISTAS sub-domain 1 and VISTAS sub-domain 3.

Table 3-1

VISTAS Sub-Domain 1 and Sub-Domain 3 Map Projection and Grid Parameters

Parameter	VISTAS Sub-Domain 1	VISTAS Sub-Domain 3
Map Projection	Lambert Conic Conformal	Lambert Conic Conformal
Center of Projection	40 N, 97 W	40 N, 97 W
Reference Latitudes	33 N, 45 N	33 N, 45 N
Datum	NWS-84 (NWS 6370KM Radius, Sphere)	NWS-84 (NWS 6370KM Radius, Sphere)
Met Grid Spacing	4 km	4 km
Southwest Corner (X)	478.004	538.004
Southwest Corner (Y)	-1177.998	-637.997
Number of E-W Grid Cells	116	263
Number of N-S Grid Cells	182	185
Vertical Layers	0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000	0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000

Figure 3.1 Map of VISTAS Sub-Domain 1 and Sub-Domain 3

3.2.1 Geophysical Data

Geophysical data such as terrain and land use are necessary inputs to the CALMET model. The geophysical data utilized in CALMET was included as part of the VISTAS dataset. Figure 3.2 presents a graphic of the terrain data within the VISTAS sub-domains. Figure 3.3 presents a graphic of the land use data and applicable default land use categories in CALMET.

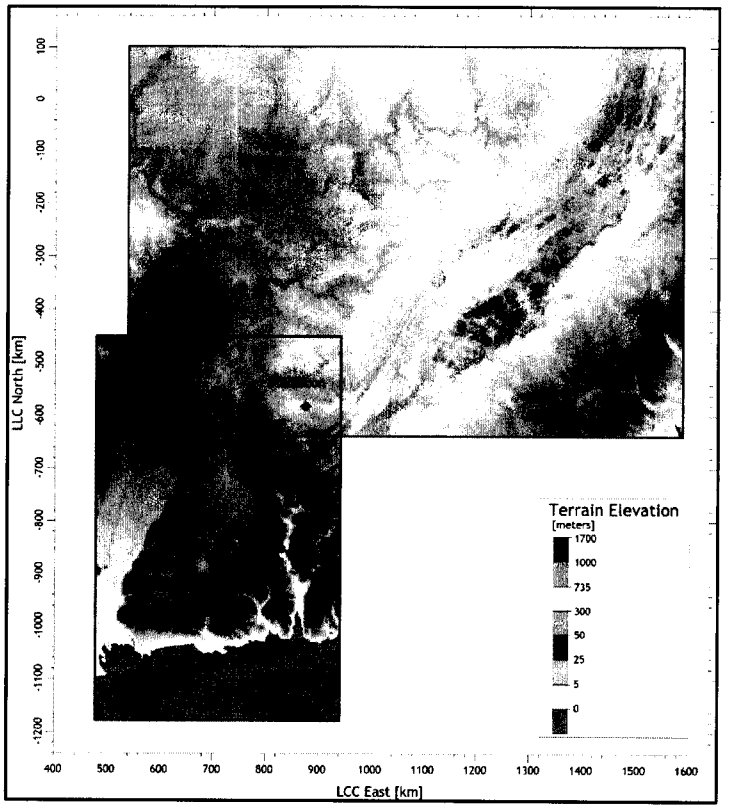

Figure 3.2 Terrain Data within VISTAS Modeling Domains

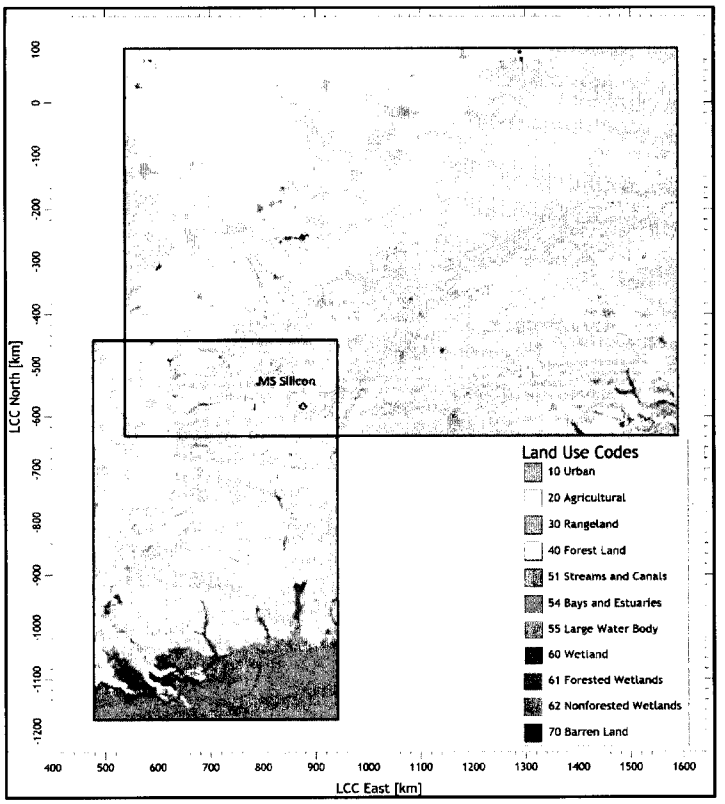

Figure 3.3 Land Use Data within VISTAS Modeling Domains

3.2.2 Meteorological Data

Concurrent surface and upper air observations for the three-year period (2001 - 2003) were included in CALMET. National Weather Service (NWS) upper air first-order surface stations within the modeling domain were provided with the VISTAS data set. Figures 3.4 and 3.5 present the locations of the upper air, surface and precipitation stations for VISTAS sub-domains 1 and 3.

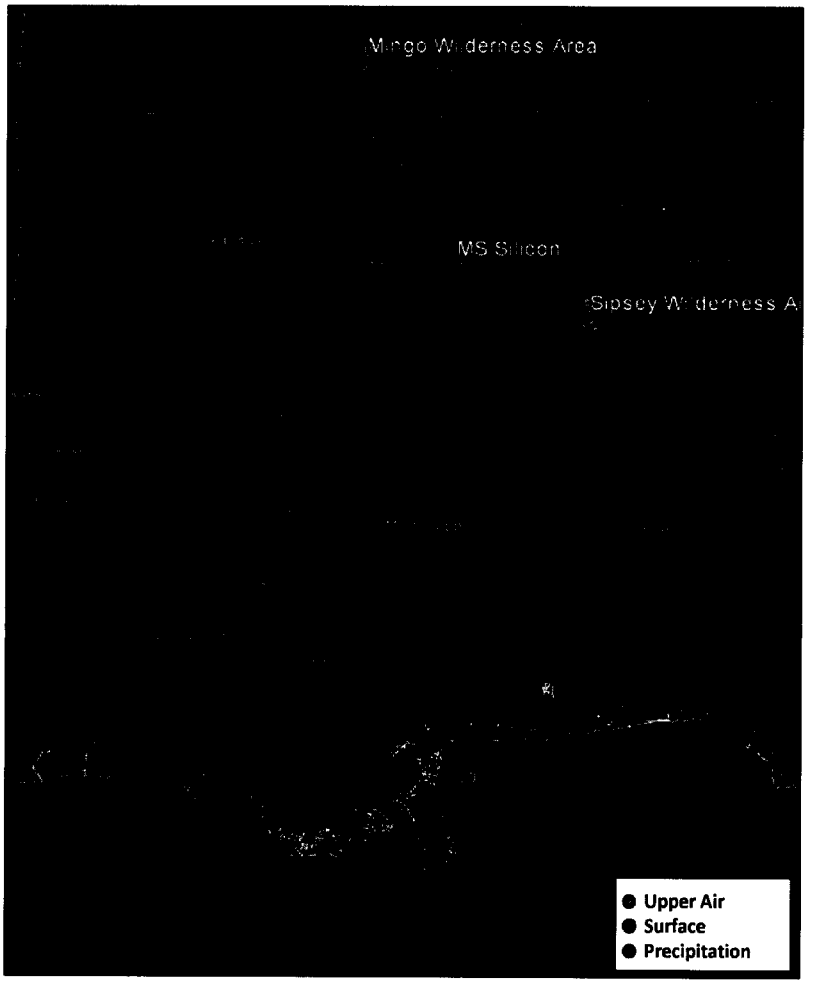

Figure 3.4 VISTAS Sub-Domain 1 Surface, Precipitation and Upper Air Stations

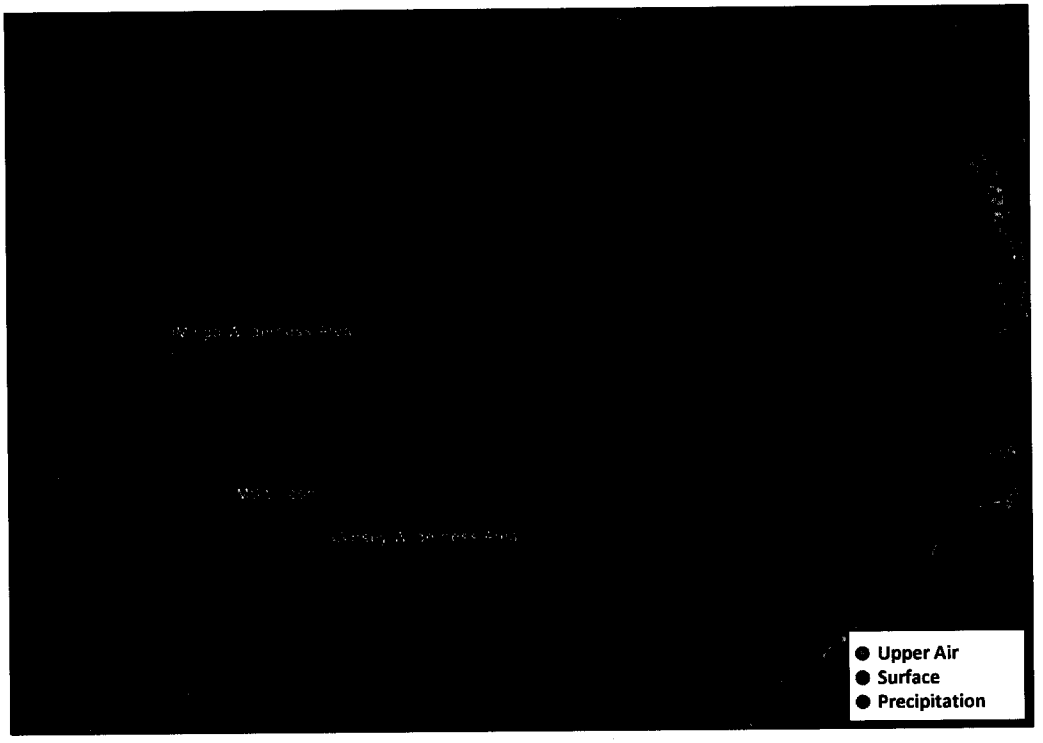

Figure 3.5 VISTAS Sub-Domain 3 Surface, Precipitation and Upper Air Stations

3.3 CALPUFF Input

Along with the CALMET meteorological data, CALPUFF requires the user to provide emissions and source data, receptor locations, input control file settings, and a background ammonia value before the model can be executed. These inputs are discussed below.

3.3.1 Emissions and Source Parameter Data

Emission estimates for two (2) arc furnaces at the MS Silicon facility for four pollutants (SO_2, NO_x, PM_{10} and $PM_{2.5}$) were modeled as "emitted species" in CALPUFF. Per guidance from the National Park Service (NPS), the PM emissions were speciated based on size and broken into the following constituents: coarse particulates (PMC) and fine particulates (PMF). Tables 3-2 through 3-4 present the stack, area, and volume source parameters that were input to CALPUFF.

Table 3-2

MS Silicon Point Source Stack Parameters and Emission Rates

LCC North (km)	Stack Height (m)	Elevation (m)	Stack Diameter (m)	Exit Velocity (m/s)	Temp. (K)	SO_2 (g/s)	NO_x (g/s)	PMC (g/s)	PMF (g/s)
-537.0618	91.44	143.59	1.93	19.37	449.82	17.8791	15.5922	0.4397	0.4397
-537.1064	91.44	143.25	1.93	19.37	449.82	17.8791	15.5922	0.4397	0.4397
-537.1890	91.44	142.62	1.93	19.37	449.82	17.8791	15.5922	0.4397	0.4397
-537.2336	91.44	142.11	1.93	19.37	449.82	17.8791	15.5922	0.4397	0.4397
-537.0533	12.19	144.35	1.37	18.29	293.15	-	-	0.0972	0.0972
-537.2669	24.384	141.93	1.37	18.29	293.15	-	-	0.0972	0.0972
-537.1173	12.19	143.3	1.07	18.29	293.15	-	-	0.0486	0.0486
-537.2117	24.384	143.3	1.07	18.29	293.15	-	-	0.0486	0.0972

aces (SAF1 and SAF2) were modeled in this PSD Class I analysis.

Table 3-3

MS Silicon Area Source Parameters and Emission Rates

	NE Corner LCC East (km)	NE Corner LCC North (km)	NW Corner LCC East (km)	NW Corner LCC North (km)	SW Corner LCC East (km)	SW Corner LCC North (km)	Effect. Height (m)	Elevation (m)	Initial Sigma Z (m)	PMC ($g/m^2/s$)	PMF ($g/m^2/s$)
1	788.896	-537.024	788.556	-537.016	788.550	-537.245	9.14	140.87	0	2.19E-06	3.95E-07
2	789.055	-537.116	788.950	-537.111	788.941	-537.276	9.14	140.79	0	3.49E-06	1.23E-06

Table 3-4

MS Silicon Volume Source Parameters and Emission Rates

Source ID	LCC East (km)	LCC North (km)	Effect. Height (m)	Elevation (m)	Initial Sigma y (m)	Initial Sigma z (m)	SO_2 (g/s)	NO_x (g/s)	PMC (g/s)	PMF (g/s)
F1	788.6559	-537.093	20.01	144.01	6.97	18.62	0.00148	0.201597	0.00126	0.00126
F2	788.6675	-537.220	20.01	143.04	6.97	18.62	0.00148	0.201597	0.00126	0.00126
CF1	788.6301	-537.107	14	144.09	5.61	13.02	-	-	0.00076	0.00076
CF2	788.6396	-537.210	14	143.49	5.61	6.51	-	-	0.00076	0.00076

3.3.2 Receptor Grids

Receptor placement location files as provided on NPS website[1] were utilized in the modeling analyses. Because the modeling domains were relatively large, the Lambert Conformal map projection was used to better accommodate the earth's curvature. The NPS conversion program was utilized to convert receptor locations from longitude and latitude into Lambert Conformal coordinates. A total of 47 receptors for the Mingo Wilderness Area and 148 receptors for the Sipsey Wilderness Area were used in this Class I analysis.

3.3.3 Chemical Species

The CALPUFF chemistry algorithms require hourly estimates of background ozone (O_3) and ammonia (NH_3) for the conversion of SO_2 and NO/NO_2 to sulfates (SO_4) and nitrates (NO_3), respectively. Ozone data were extracted using CalPro from a standard ozone dataset associated with the VISTAS CALMET dataset (Sub Domain 1 or 3). For missing ozone concentrations, CALPUFF fills missing ozone concentrations with a background concentrations provided in group 11 of the CALPUFF input file.

[1] http://www.nature.nps.gov/air/Maps/Receptors/index.cfm

A background ozone concentration of 60 parts per billion (ppb) provided by the U.S. Forest Service (FS) FLM was used for the Sipsey Wilderness Area. A background ozone concentration of 40 ppb was used in the Mingo Wilderness Area analysis and was based on a previously approved modeling study. A monthly background concentration for NH_3 of 2 ppb was utilized in both Class I analyses per discussions with FLMs.

Essential CALPUFF switch settings regarding chemical species:

- Chemical species modeled: SO_2, SO_4, NO_X, HNO_3, NO_3, PMC, PMF
- Chemical species emitted: SO_2, NO_X, PMC, PMF
- Chemical parameters for dry deposition of gases (from IWAQM):
  - Diffusivity: SO_2 = 0.1509 cm^2/s; NO_X = 0.1656 cm^2/s; HNO_3 = 0.1628 cm^2/s,
  - Alpha Star: SO_2 = 1000.0; NO_X = 1.0; HNO_3 = 1.0,
  - Reactivity: SO_2 = 8.0; NO_X = 8.0; HNO_3 = 18.0,
  - Mesophyll Resistance: SO_2 = 0.0 s/cm; NO_X = 5.0 s/cm; HNO_3 = 0.0 s/cm,
  - Henry's Law Coefficient: SO_2 = 0.04; NO_X = 3.5; HNO_3 = 0.0000001,
- Geometric mass mean diameter and standard deviation for dry deposition of particles:
  - SO_4 mass mean diameter 0.48 microns; standard deviation 2.0 microns,
  - NO_3 mass mean diameter 0.48 microns; standard deviation 2.0 microns,
  - PMC mass mean diameter 6.0 microns; standard deviation 2.0 microns
  - PMF mass mean diameter 0.48 microns; standard deviation 2.0 microns
- Wet Deposition Scavenging Coefficient:
  - SO_2 liquid precipitation 3.2E-5 s^{-1}; frozen precipitation 0.0E+0,
  - SO_4 liquid precipitation 1.0E-4 s^{-1}; frozen precipitation 3.0E-5,
  - HNO_3 liquid precipitation 6.0E-5 s^{-1}; frozen precipitation 0.0E+0,
  - NO_3 liquid precipitation 1.0E-4 s^{-1}; frozen precipitation 3.0E-5,
  - PMC liquid precipitation 1.0E-4 s^{-1}; frozen precipitation 3.0E-5,
  - PMF liquid precipitation 1.0E-4 s^{-1}; frozen precipitation 3.0E-5,

3.3.4 CALPUFF Switch Settings

CALPUFF was run using a combination of IWAQM-recommended switch settings and successive switch settings recommended in the FLM CALPUFF Reviewer's guide-FNL-20110523. The CALPUFF control parameters and technical options which were used in the far-field analyses are presented in Appendix A.

3.4 POSTUTIL

POSTUTIL (Version 1.56), a program that transforms particle size species to new species and produces the necessary concentration files that are then used by CALPOST for post-processing of results, was used for these analyses. POSTUTIL occurs prior to the visibility processing in CALPOST and allows the user to sum the contributions of sources from different CALPUFF simulations into a total concentration file.

POSTUTIL was run twice prior to processing concentrations in CALPOST. The first run computed the partition for the total concentration fields (SO_4, NO_3, HNO_3, NH_3). The second run separated the sulfur and nitrogen into sulfur (derived from SO_2 and SO_4) and nitrogen (derived from NO_x, HNO_3, NO_3, and SO_4) species and merged the wet and dry flux concentrations for the final deposition calculations. Default switch settings were used in POSTUTIL including the scaling factors which are based on the molecular weight of sulfur or nitrogen to the molecular weight of the compound modeled by CALPUFF.

Essential switch POSTUTIL settings for recomputing the HNO_3/NO_3 partition concentrations:

- MNITRATE = 1
- Background NH_3 (BCKNH3) = 12*3

Essential POSTUTIL switch settings for merging wet and dry deposition flux and separating sulfur and nitrogen species concentrations:

- MNITRATE = 0
- Sulfur (S) and nitrogen (N) species specified for output
- Sulfur species scaling factors:
  - SO_2 = 0.500000
  - SO_4 = 0.333333
  - NO_x = 0.0
  - HNO_3 = 0.0
  - NO_3 = 0.0
- Nitrogen species scaling factors:
  - SO_2 = 0.0
  - SO_4 = 0.291667
  - NO_x = 0.304348
  - HNO_3 = 0.222222
  - NO_3 = 0.451613

3.5 CALPOST

The EPA-recommended version of the CALPOST model (Version 6.221) was used to calculate the concentration results for comparison to the modeling significance levels and the deposition flux for total sulfur and nitrogen. Calculations of the impact of the simulated plume particulate matter component concentrations on light extinction were also carried out with the CALPOST postprocessor. CALPOST performs averaging and ranking of the concentration and deposition files derived using CALPUFF and/or POSTUTIL. The CALPUFF modeling system switch settings and model options were based on IWAQM recommended switch settings and successive switch settings recommended in the FLM CALPUFF Reviewer's guide-FNL-20110523.

Essential switch CALPOST settings for visibility used in this analysis:

- MVISCHECK = 1
- ASPEC = VISIB
- $LVNO_2$ = T
- NO_2CALC = 1
- RNO_2NOX = 1.0
- MVSIBK = 8
- M8_MODE = 5
- AREA NAME = MING or SIPS (dependent on Class I area being analyzed)
- Particle growth curve f(RH) for hygroscopic species (MFRH) = 4
- Maximum relative humidity used in particle growth (RHMAX) = 95%
- Background light extinction (BEXTBK) = 11
- Percentage of particles affected by relative humidity (RHFRAC) = 10
- Monthly concentrations of ammonium sulfate ($BKSO_4$ from FLAG 2010 Table 6)
    - All Mingo monthly values = 0.23
    - All Sipsey monthly values = 0.23
- Monthly concentrations of ammonium nitrate (BKNO3 from FLAG 2010 Table 6)
    - All Mingo monthly values = 0.10
    - All Sipsey monthly values = 0.10
- Monthly concentrations of coarse particulates (BKPMC from FLAG 2010 Table 6)
    - All Mingo monthly values = 3.05
    - All Sipsey monthly values = 3.00
- Monthly concentrations of organic carbon (BKOC from FLAG 2010 Table 6)
    - All Mingo monthly values = 1.83
    - All Sipsey monthly values = 1.80
- Monthly concentrations of soil (BKSOIL from FLAG 2010 Table 6)
    - All Mingo monthly values = 0.51
    - All Sipsey monthly values = 0.50

- Monthly concentrations of elemental carbon (BKEC from FLAG 2010 Table 6)
  - All Mingo monthly values = 0.02
  - All Sipsey monthly values = 0.02
- Monthly concentrations of sea salt (BKSALT from FLAG 2010 Table 6)
  - All Mingo monthly values = 0.04
  - All Sipsey monthly values = 0.04
- Monthly RH adjustment factors for small ammonium sulfate and ammonium nitrate particle size (RHFSML from FLAG 2010 Table 8)
  - Mingo monthly values: 3.74, 3.38, 3.07, 2.97, 3.39, 3.52, 3.57, 3.64, 3.72, 3.47, 3.43, 3.74
  - Sipsey monthly values: 3.89, 3.52, 3.23, 3.13, 3.60, 3.99, 4.13, 4.09, 4.12, 3.87, 3.61, 3.89
- Monthly RH adjustment factors for large ammonium sulfate and ammonium nitrate particle size (RHFLRG from FLAG 2010 Table 7)
  - Mingo monthly values: 2.73, 2.52, 2.34, 2.28, 2.53, 2.60, 2.64, 2.67, 2.71, 2.56, 2.56, 2.73
  - Sipsey monthly values: 2.79, 2.58, 2.42, 2.36, 2.64, 2.86 ,2.94, 2.92, 2.93, 2.78, 2.64, 2.80
- Monthly RH adjustment factors for sea salt particles (RHFSEA from FLAG 2010 Table 9)
  - Mingo monthly values: 3.92, 3.58, 3.30, 3.19, 3.58, 3.72, 3.80, 3.82, 3.85, 3.61, 3.66, 3.90
  - Sipsey monthly values: 3.94, 3.60, 3.36, 3.28, 3.72, 4.06, 4.18, 4.14, 4.13, 3.91, 3.74, 3.96
- Extinction due to Rayleigh (BEXTRA): Mingo = 12, Sipsey = 10

The Deposition Analysis Threshold (DAT) has units of kilograms per hectare per year (kg/ha/year) and CALPOST outputs deposition units of migrograms per meter squared per second ($\mu g/m^2/s$). For deposition processing in CALPOST, a scaling factor of 315.56926 was used in Input Group 1 to convert deposition values from $\mu g/m^2/s$ to kg/ha/year. The CALPOST summary files have a default header in the summary section indicating concentration units as $\mu g/m^2/s$; however, these units are incorrect and resultant concentrations have been converted to kg/ha/year with the use of the scaling factor.

4.0 CALPUFF MODELING RESULTS

This section presents the CALPUFF modeling results and the predicted impacts from emissions from the proposed MS Silicon facility on the PSD Class I increment and AQRVs at the Sipsey and Mingo Wilderness Areas.

4.1 PSD Class I Increment Analysis CALPUFF Modeling Results

CALPUFF modeling was used to estimate the maximum ambient concentrations of SO_2, NO_2, PM_{10}, and $PM_{2.5}$ at the Sipsey and Mingo Wilderness Areas to compare to US EPA-proposed Class I Significant Impact Levels (SILs) listed in Table 4-1. The CALPOST program was used to obtain pollutant-specific impacts for the pertinent averaging periods. According to EPA guidance, if maximum concentrations are below the SILs, then emissions from the facility are assumed to be insignificant and no further analysis is needed.

The PSD increment modeling results for the proposed project emissions are provided in Tables 4-1 and 4-2. Figures 4.1 through 4.8 present the modeled maximum concentration isopleths for the three years modeled at the Sipsey Wilderness Area. Figures 4.9 through 4.16 present the modeled maximum concentration isopleths for the three years modeled at the Mingo Wilderness Area. The modeling results indicate that the proposed project has insignificant impacts for all pollutants and averaging times for all years modeled at the Mingo Wilderness Area (Table 4-2). Therefore, no additional modeling for PSD increment consumption is required for the Mingo Wilderness Area. From Table 4-1, three- and 24-hour maximum modeled SO_2 concentrations are above the PSD Class I SIL at the Sipsey Wilderness Area. However, at this time the Mississippi Department of Environmental Quality (MDEQ) and FLM's have not required a cumulative increment analysis to be conducted.

Table 4-1
CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Sipsey Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations ($\mu g/m^3$)			Class I Significant Impact Levels (SILs) ($\mu g/m^3$)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.8775	0.5986	**1.2454**	1.0	**124.5**
	3-hour (H2H)	0.6231	0.5672	0.9001	1.0	90.0
	24-hour (H1H)	**0.2371**	0.1958	**0.2551**	0.2	**127.5**
	24-hour (H2H)	0.1548	0.1947	**0.2235**	0.2	**111.7**
	Annual (H1H)	0.0074	0.0082	0.0104	0.1	10.4
NO_2	Annual (H1H)	0.0050	0.0058	0.0070	0.1	7.0
PM_{10}	24-hour (H1H)	0.0071	0.0046	0.0044	0.3	2.4
	24-hour (H2H)	0.0050	0.0031	0.0041	0.3	1.7
	Annual (H1H)	0.0002	0.0002	0.0002	0.2	0.1
$PM_{2.5}$	24-hour (H1H)	0.0139	0.0077	0.0081	0.07	19.8
	24-hour (H2H)	0.0074	0.0074	0.0072	0.07	10.6
	Annual (H1H)	0.0004	0.0003	0.0004	0.06	0.7

Table 4-2
CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Mingo Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (µg /m3)			Class I Significant Impact Levels (SILs) ($\mu g/m^3$)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.0798	0.2387	0.1317	1.0	23.9
	3-hour (H2H)	0.0636	0.1173	0.0794	1.0	11.7
	24-hour (H1H)	0.0243	0.0563	0.0305	0.2	28.1
	24-hour (H2H)	0.0401	0.0313	0.0252	0.2	20.1
	Annual (H1H)	0.0006	0.0008	0.0008	0.1	0.85
NO_2	Annual (H1H)	0.0004	0.0002	0.0003	0.1	0.36
PM_{10}	24-hour (H1H)	0.0004	0.0011	0.0007	0.3	0.36
	24-hour (H2H)	0.0003	0.0006	0.0006	0.3	0.21
	Annual (H1H)	0.0000	0.0000	0.0000	0.2	0.01
$PM_{2.5}$	24-hour (H1H)	0.0012	0.0019	0.0020	0.07	2.9
	24-hour (H2H)	0.0010	0.0014	0.0019	0.07	2.7
	Annual (H1H)	0.0000	0.0000	0.0000	0.06	0.07

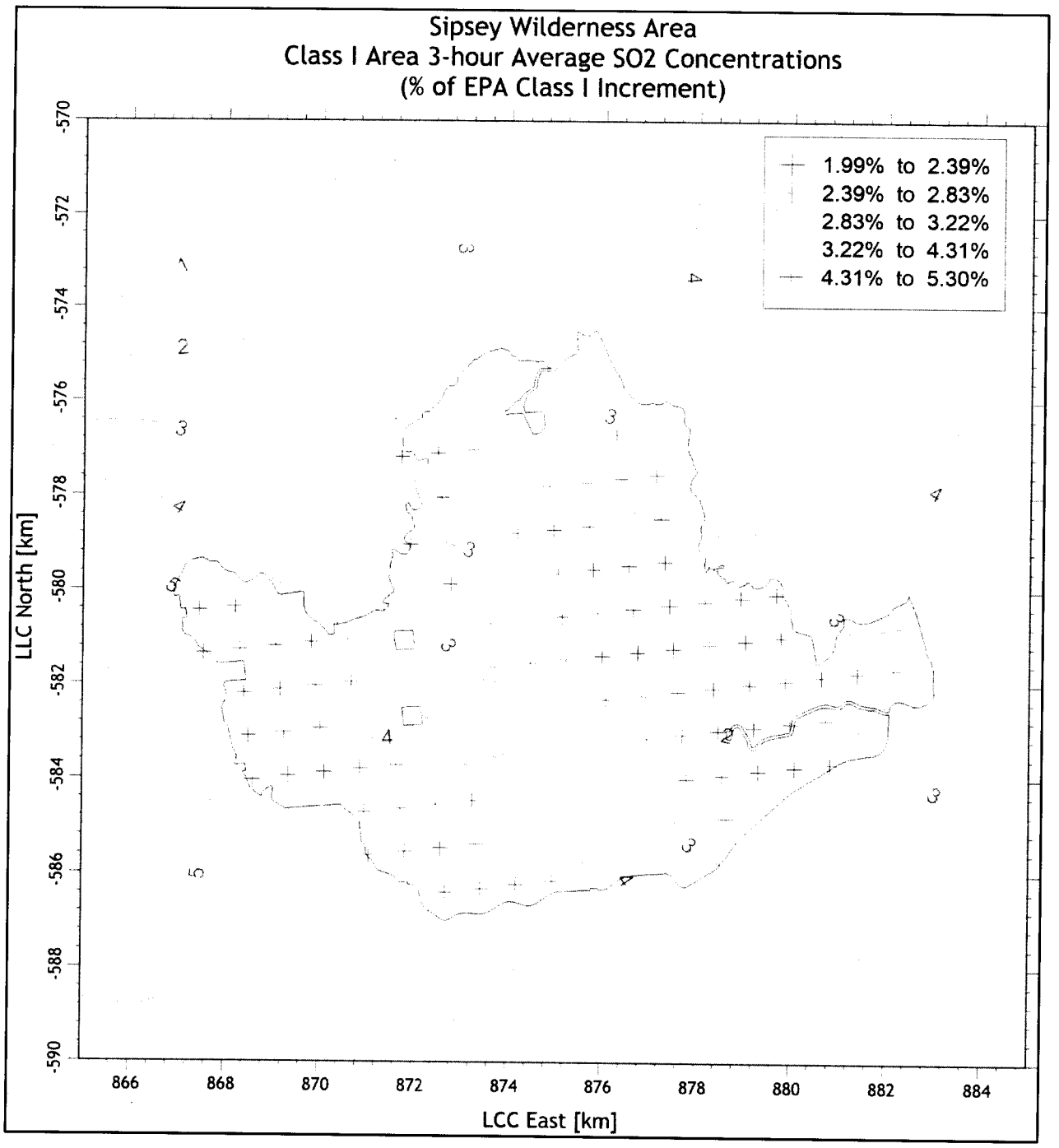

Figure 4.1 Modeled Maximum Three-Hour SO_2 Concentration as Percent of PSD Class I Increment at Sipsey Wilderness Area

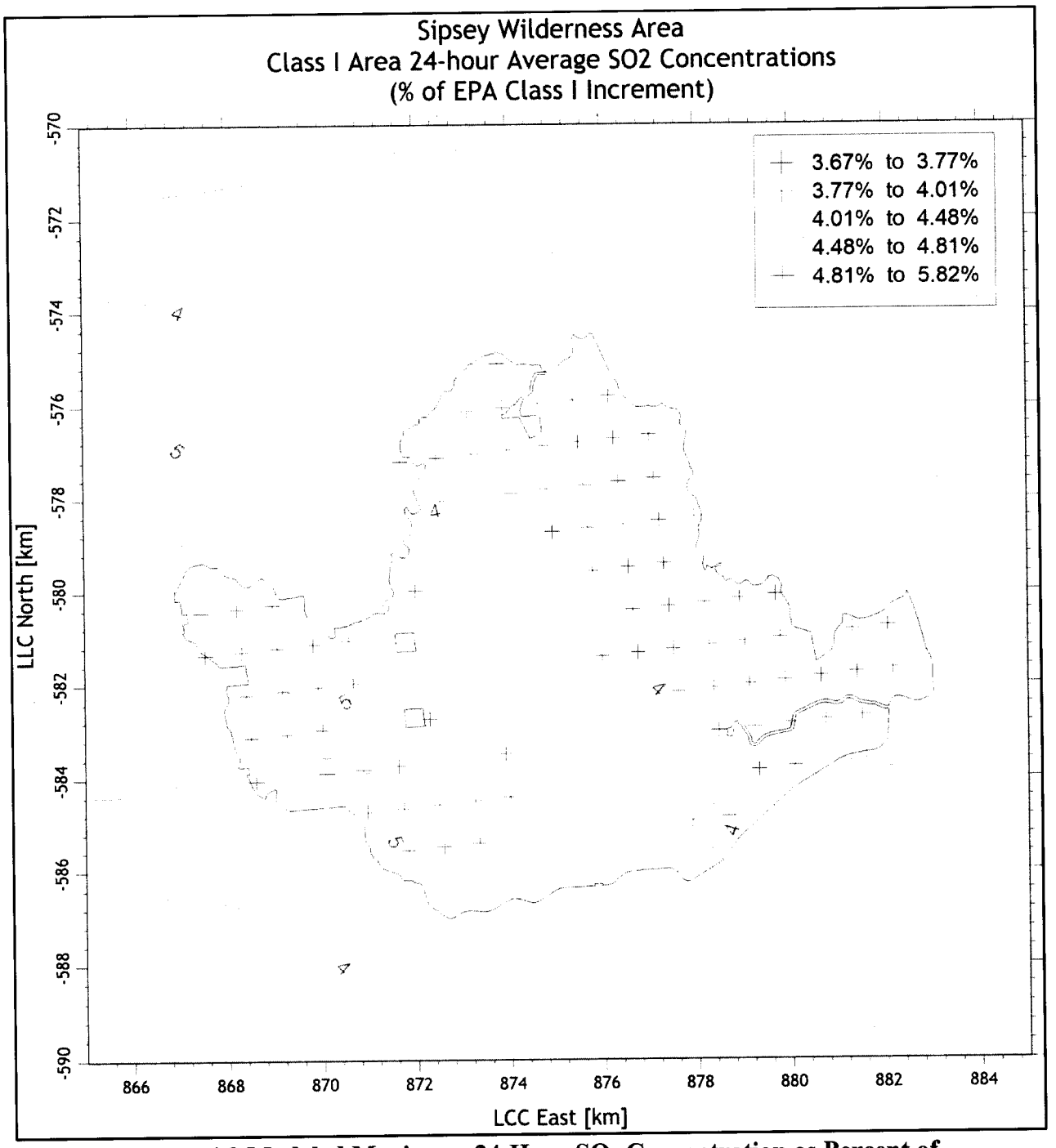

Figure 4.2 Modeled Maximum 24-Hour SO_2 Concentration as Percent of PSD Class I Increment at Sipsey Wilderness Area

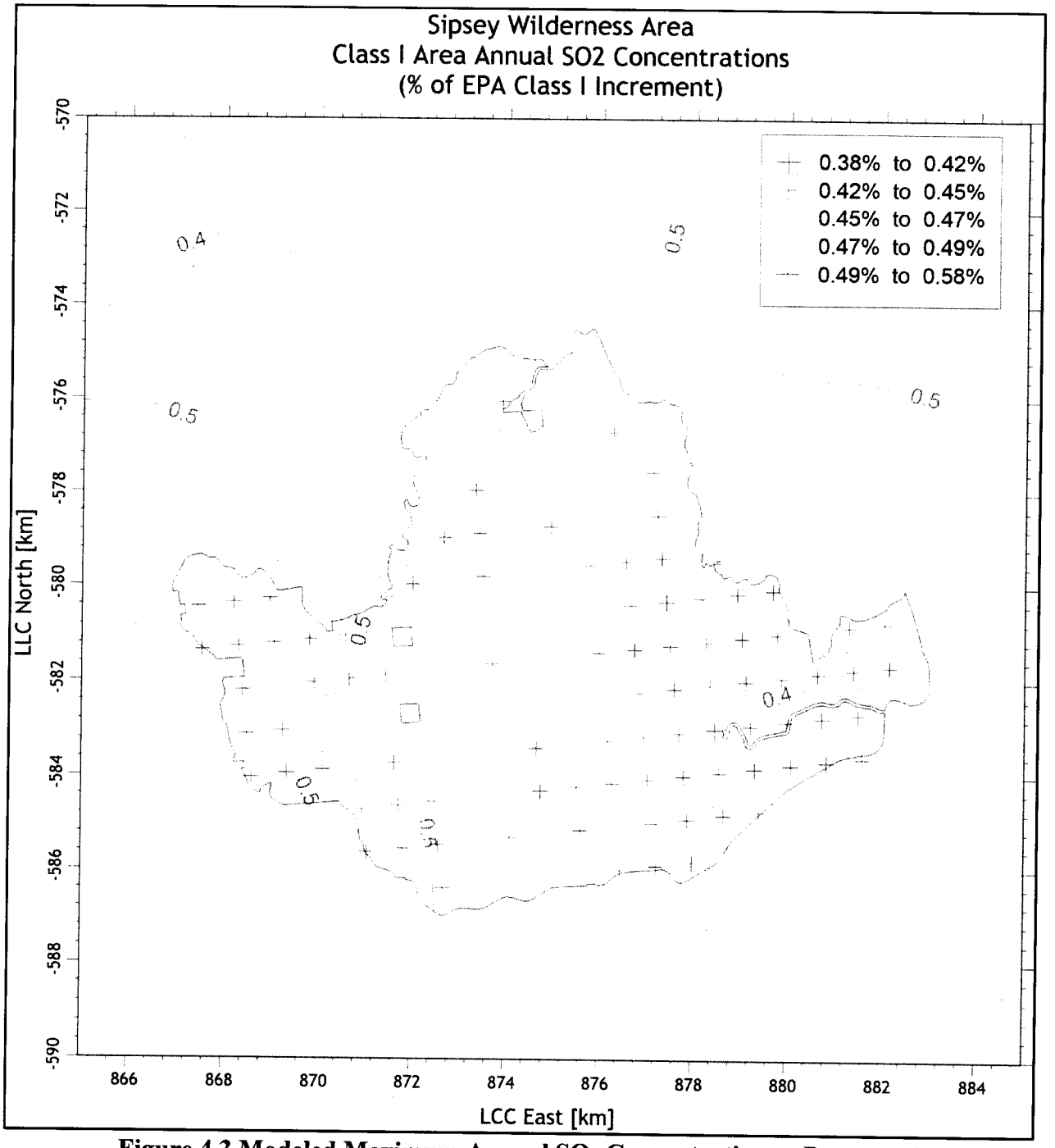

Figure 4.3 Modeled Maximum Annual SO_2 Concentration as Percent of PSD Class I Increment at Sipsey Wilderness Area

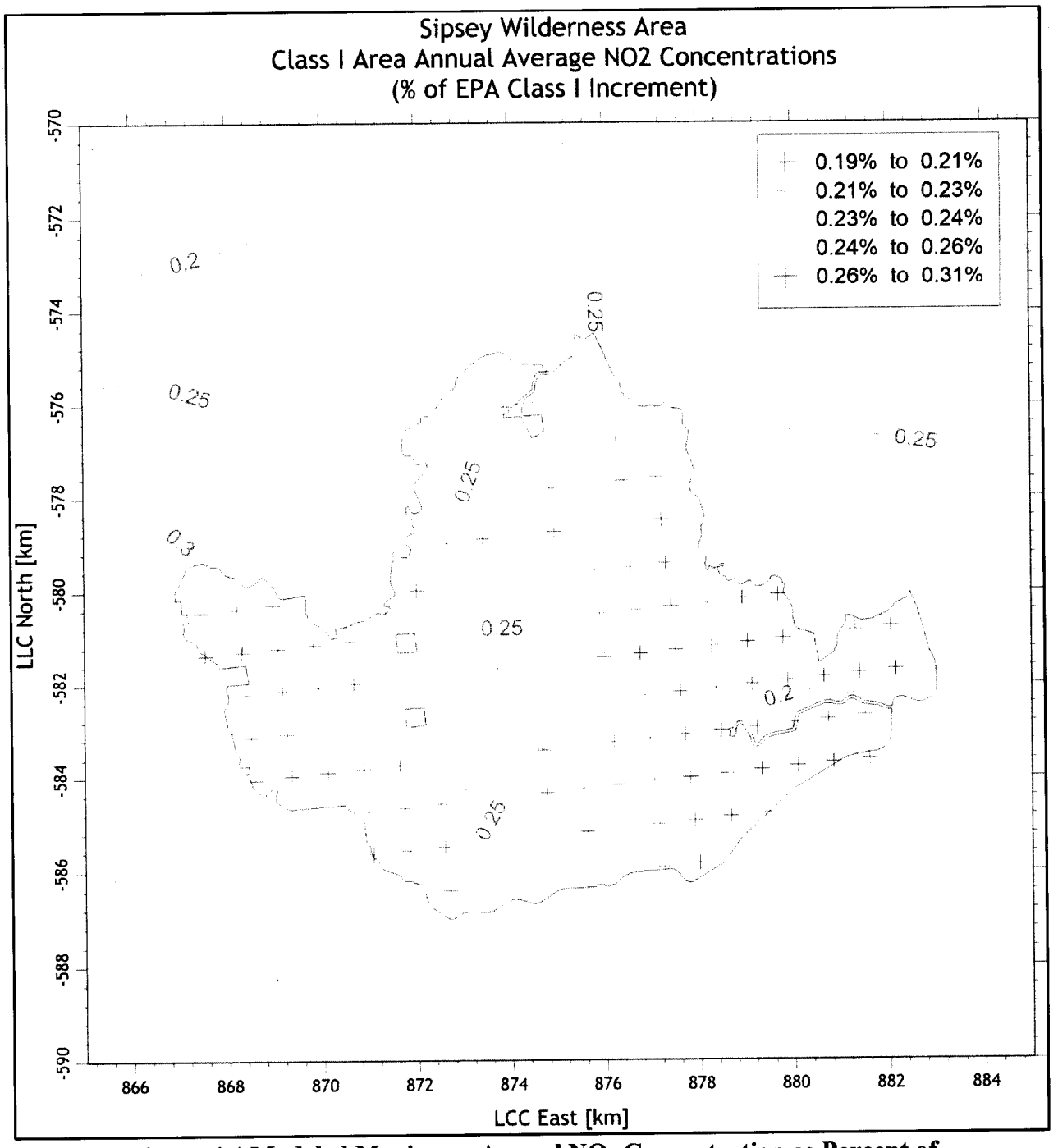

Figure 4.4 Modeled Maximum Annual NO_2 Concentration as Percent of PSD Class I Increment at Sipsey Wilderness Area

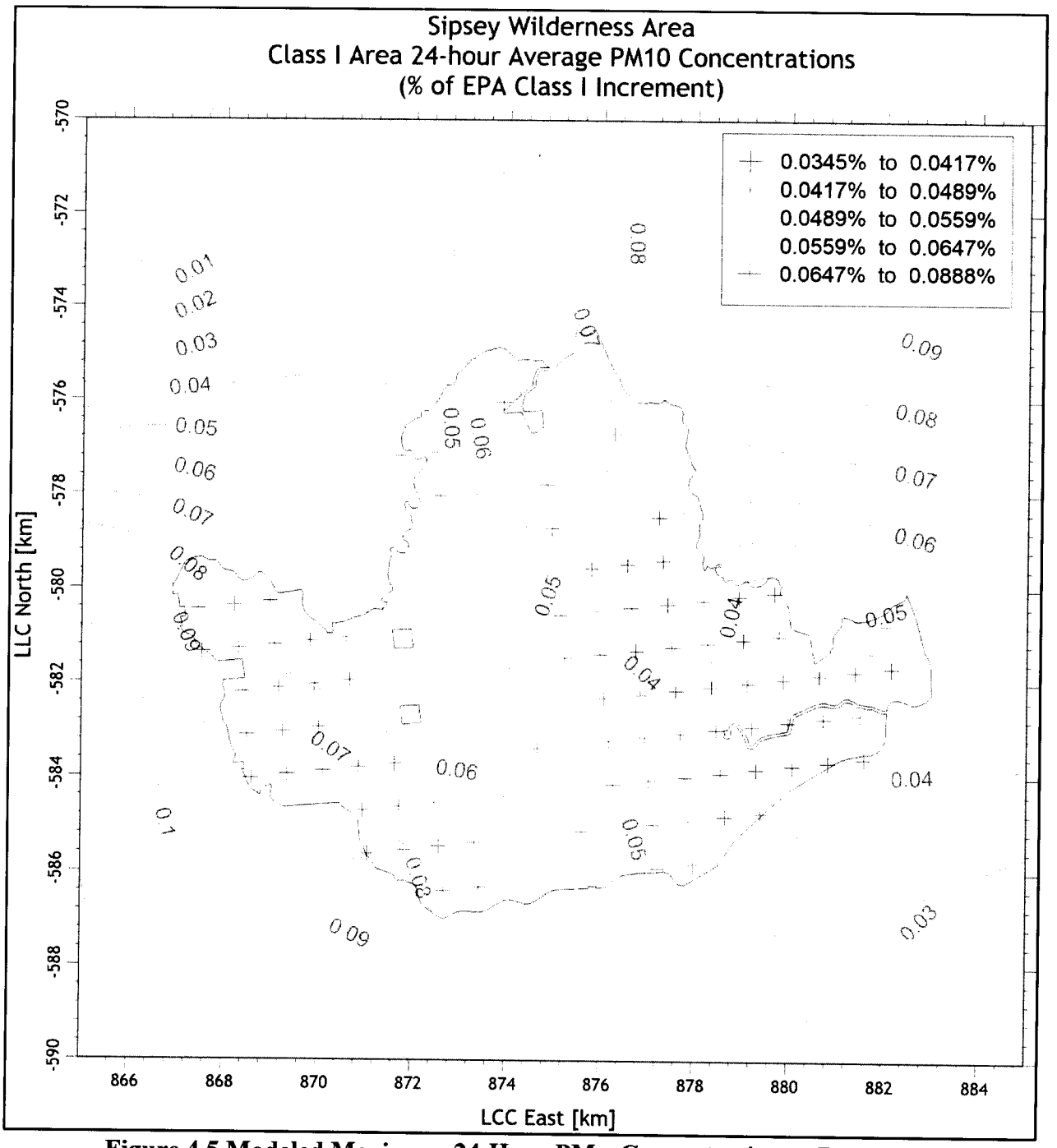

Figure 4.5 Modeled Maximum 24-Hour PM_{10} Concentration as Percent of PSD Class I Increment at Sipsey Wilderness Area

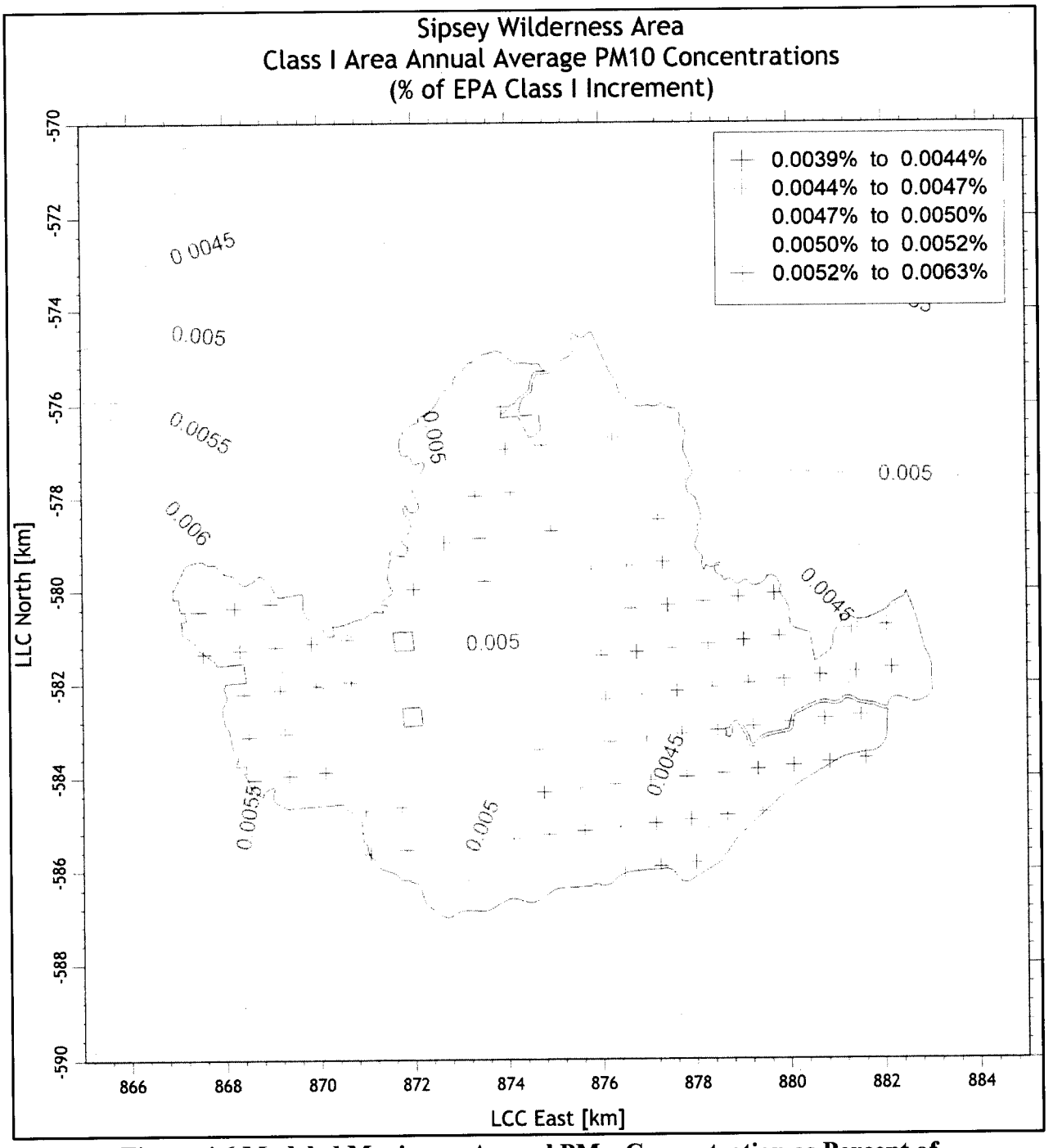

Figure 4.6 Modeled Maximum Annual PM_{10} Concentration as Percent of PSD Class I Increment at Sipsey Wilderness Area

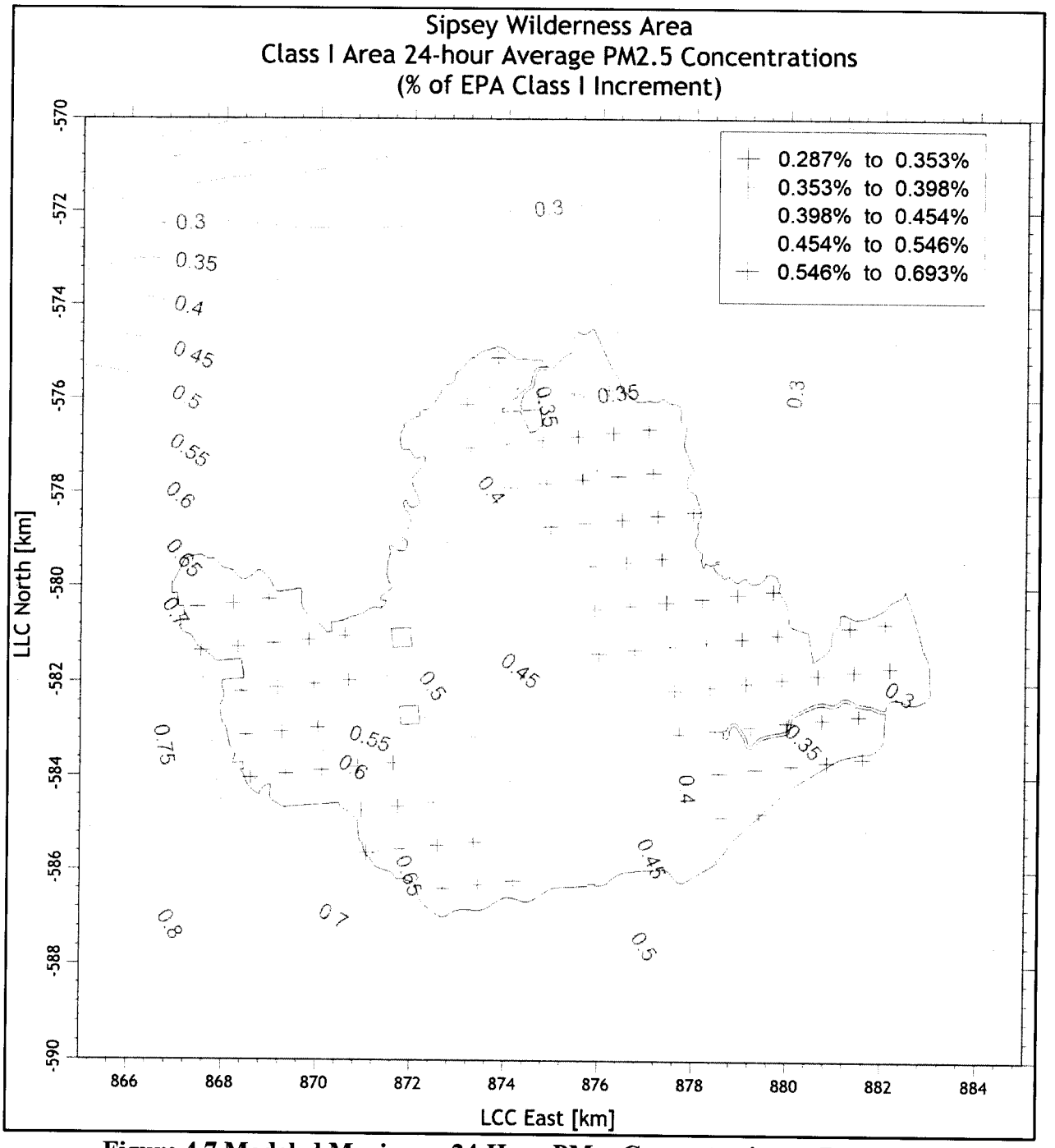

Figure 4.7 Modeled Maximum 24-Hour $PM_{2.5}$ Concentration as Percent of PSD Class I Increment at Sipsey Wilderness Area

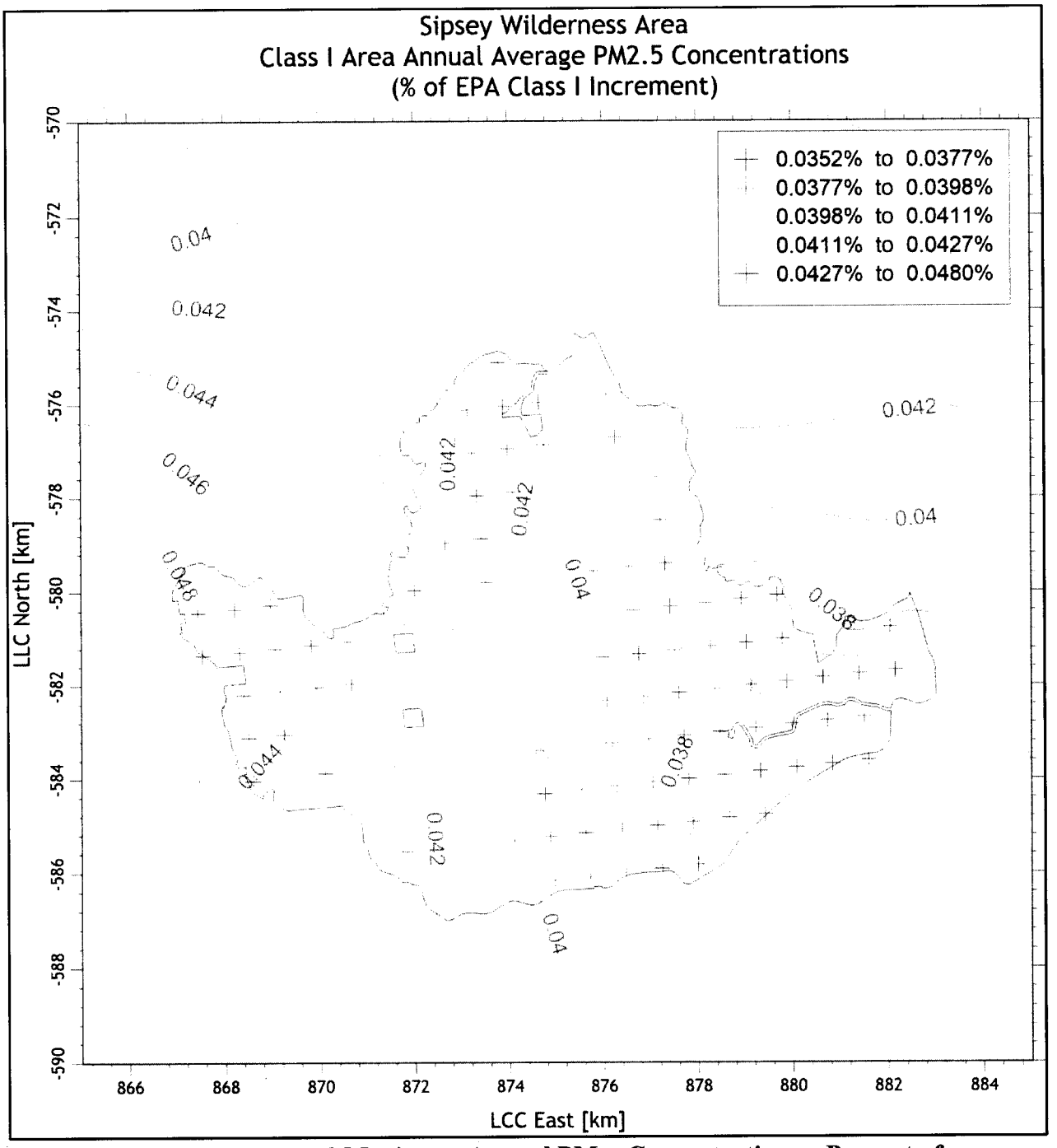

Figure 4.8 Modeled Maximum Annual $PM_{2.5}$ Concentration as Percent of PSD Class I Increment at Sipsey Wilderness Area

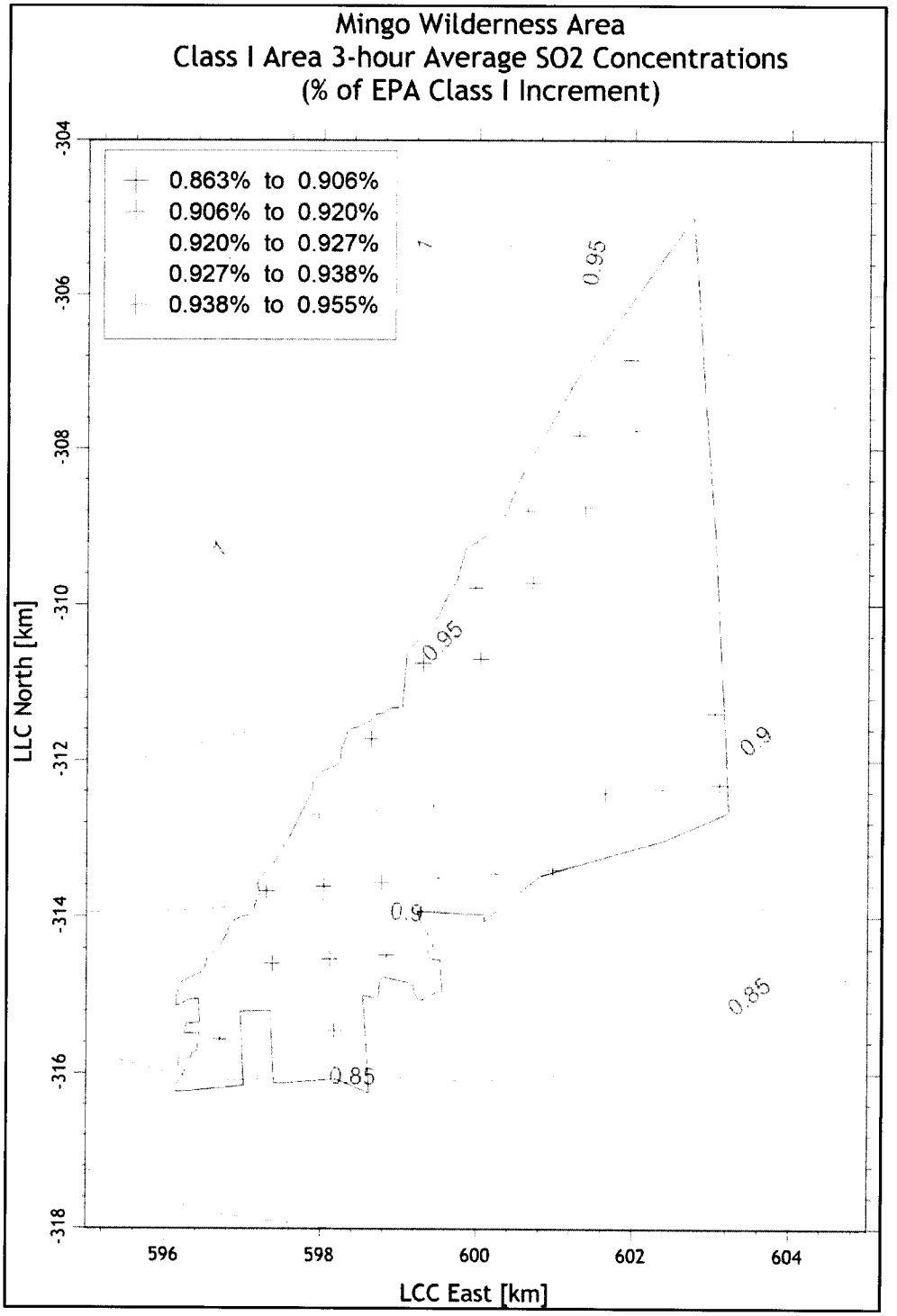

Figure 4.9 Modeled Maximum Three-Hour SO_2 Concentration as Percent of PSD Class I Increment at Mingo Wilderness Area

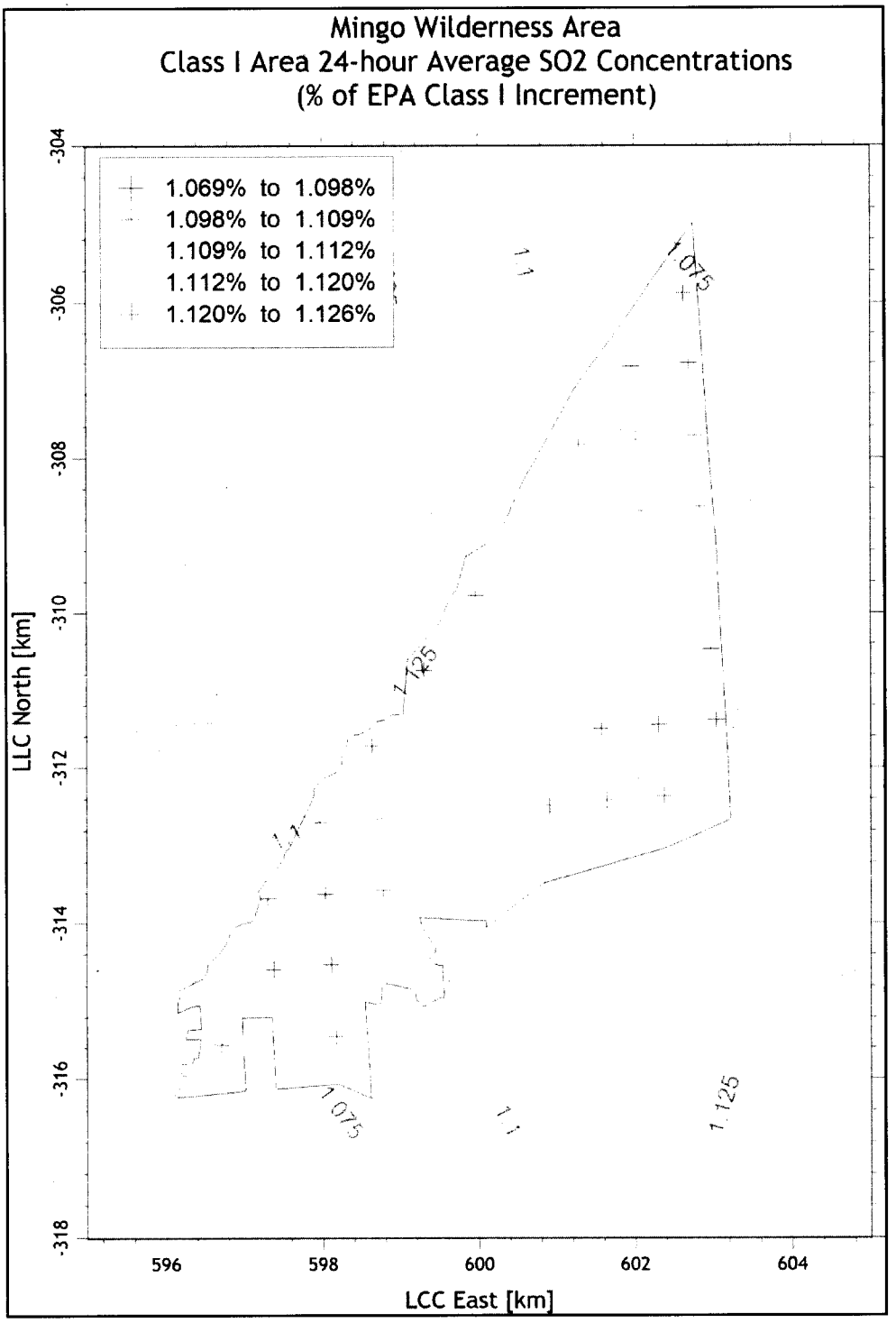

Figure 4.10 Modeled Maximum 24-Hour SO_2 Concentration as Percent of PSD Class I Increment at Mingo Wilderness Area

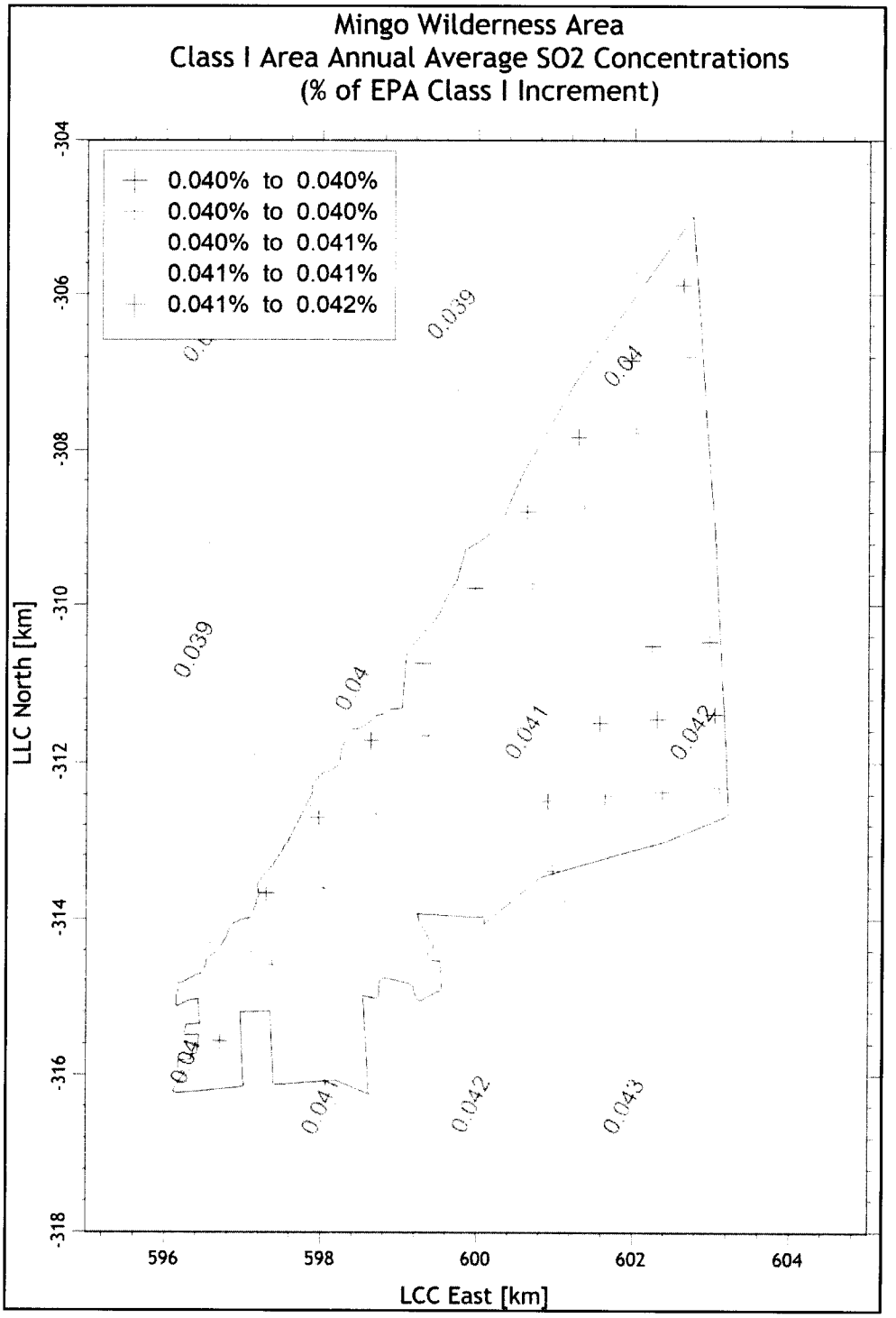

Figure 4.11 Modeled Maximum Annual SO_2 Concentration as Percent of PSD Class I Increment at Mingo Wilderness Area

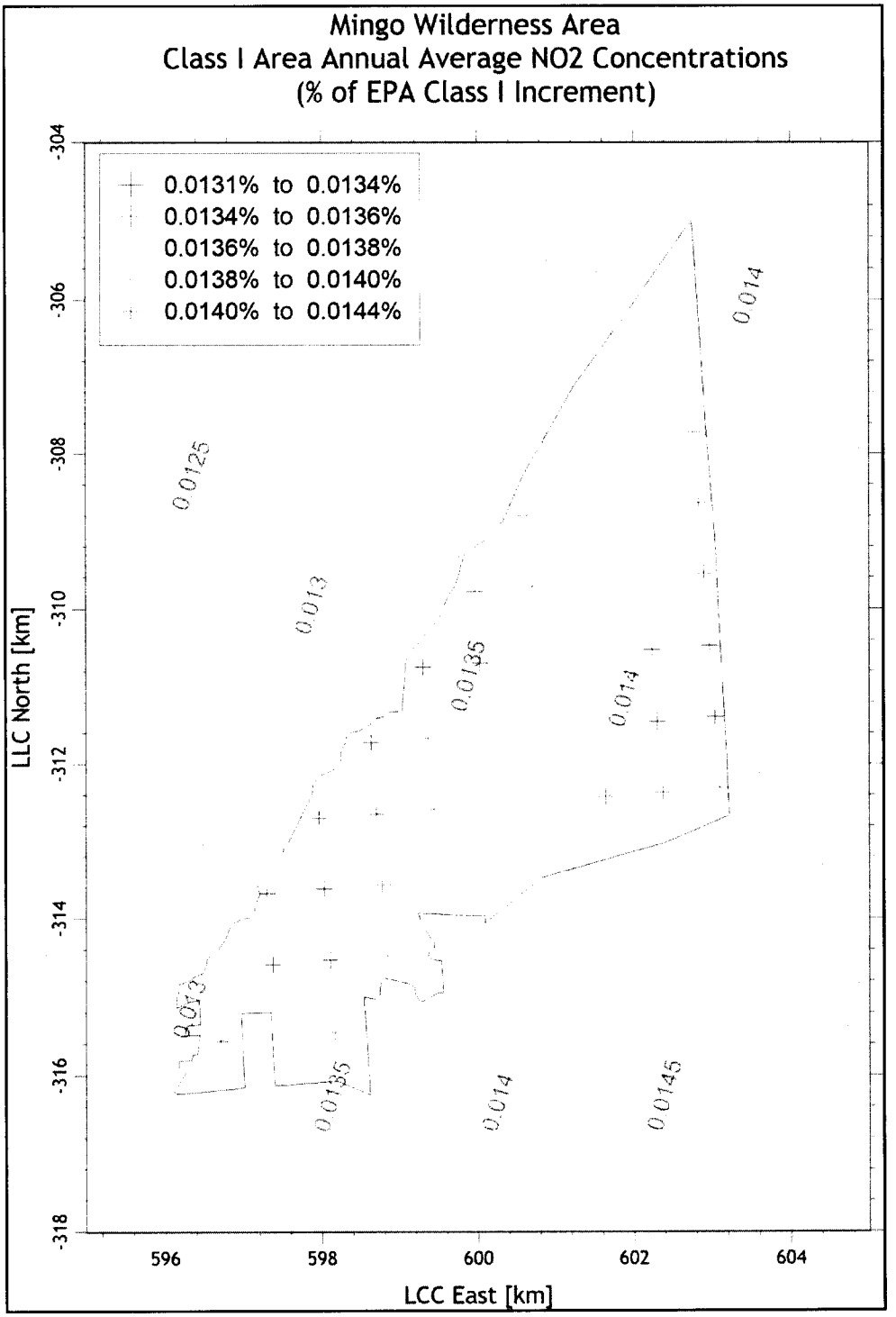

Figure 4.12 Modeled Maximum Annual NO_2 Concentration as Percent of PSD Class I Increment at Mingo Wilderness Area

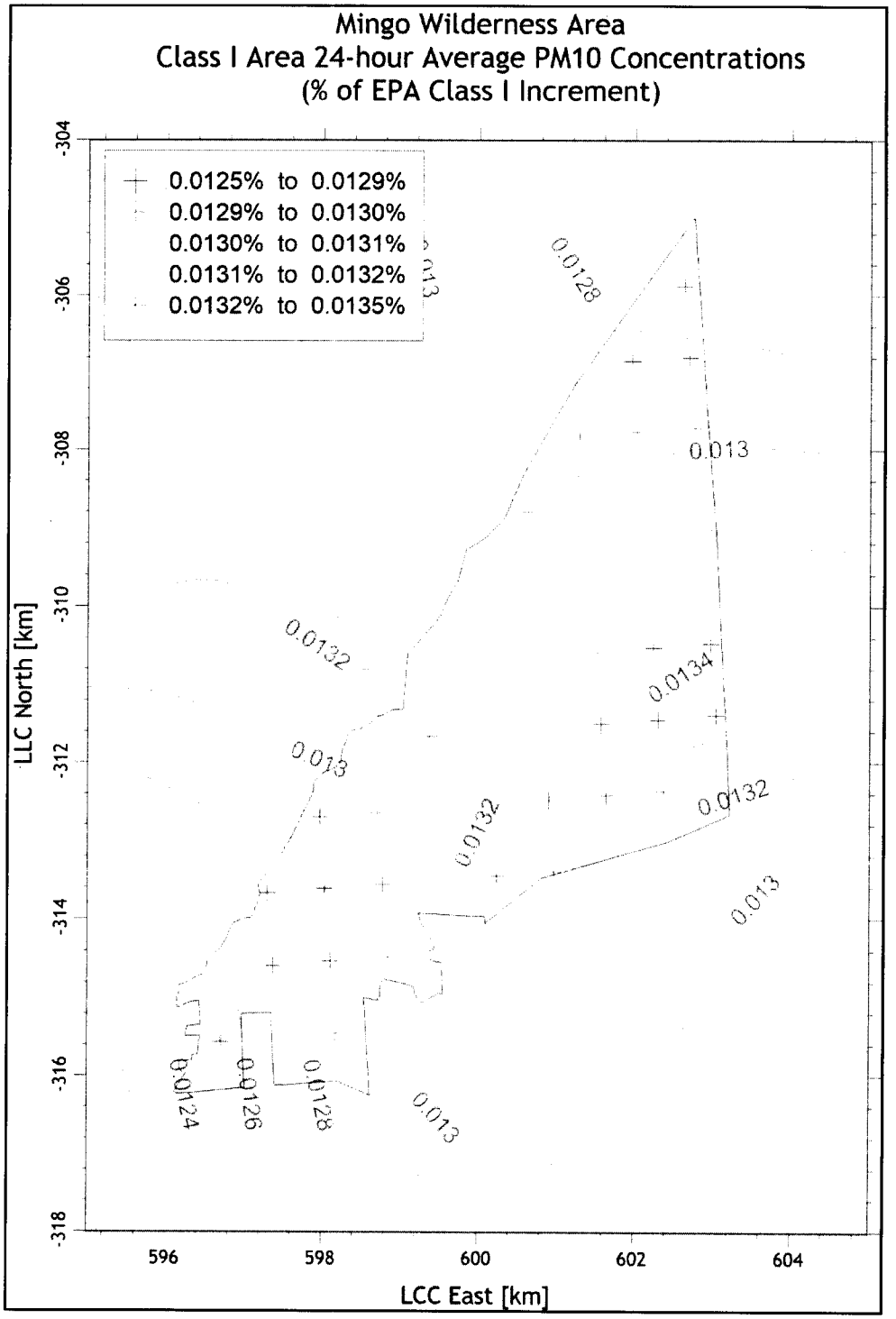

Figure 4.13 Modeled Maximum 24-Hour PM_{10} Concentration as Percent of PSD Class I Increment at Mingo Wilderness Area

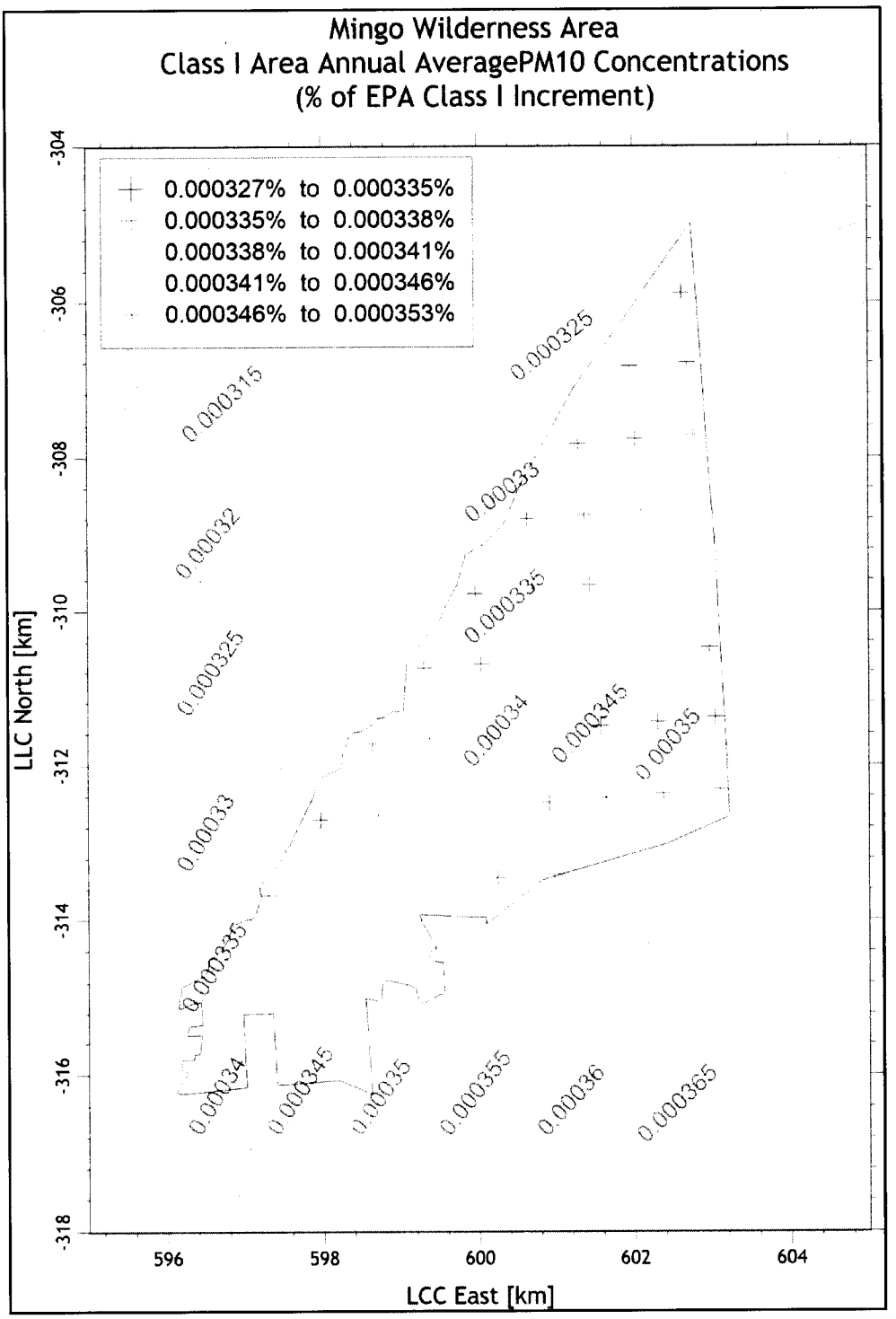

Figure 4.14 Modeled Maximum Annual PM_{10} Concentration as Percent of PSD Class I Increment at Mingo Wilderness Area

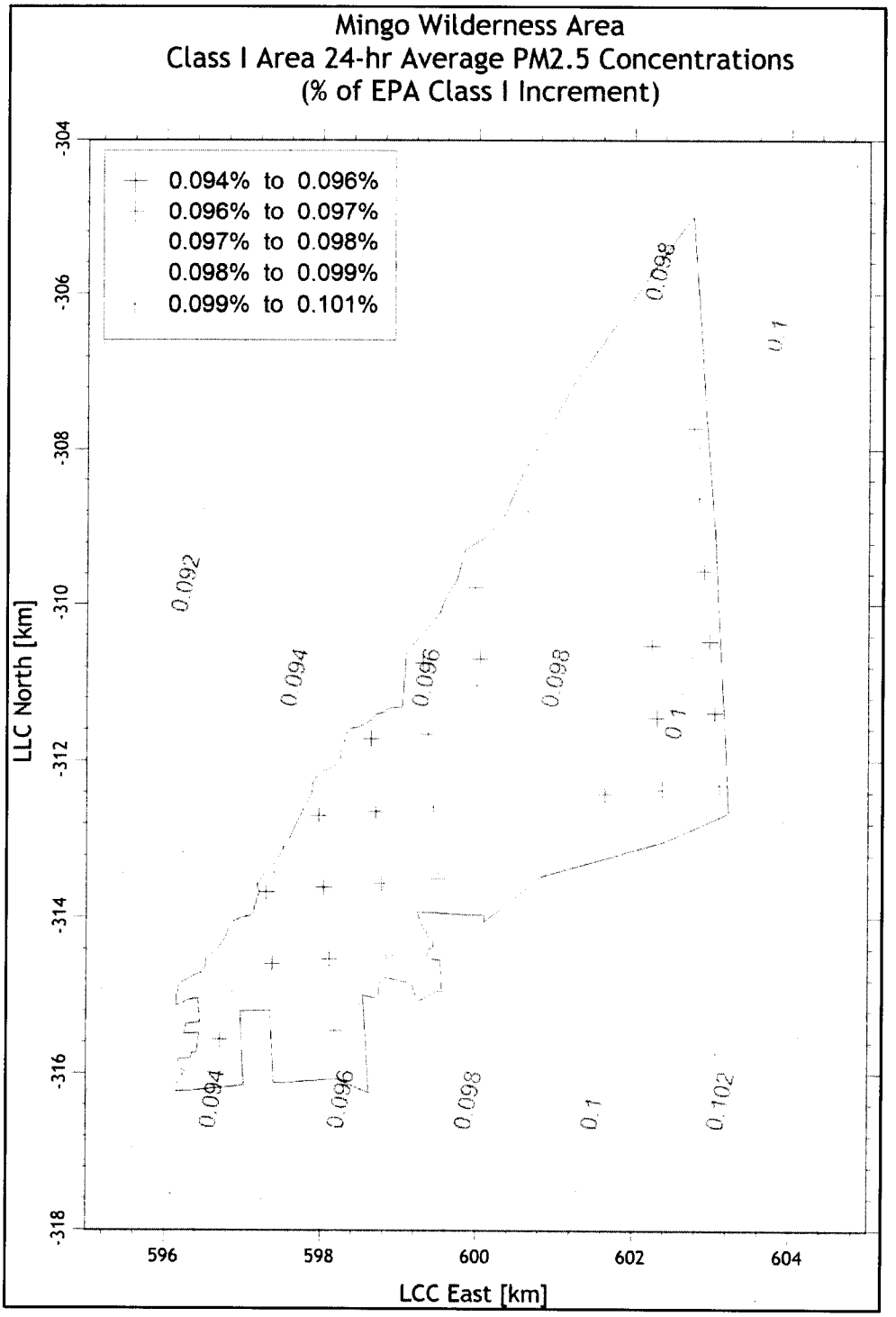

Figure 4.15 Modeled Maximum 24-Hour $PM_{2.5}$ Concentration as Percent of PSD Class I Increment at Mingo Wilderness Area

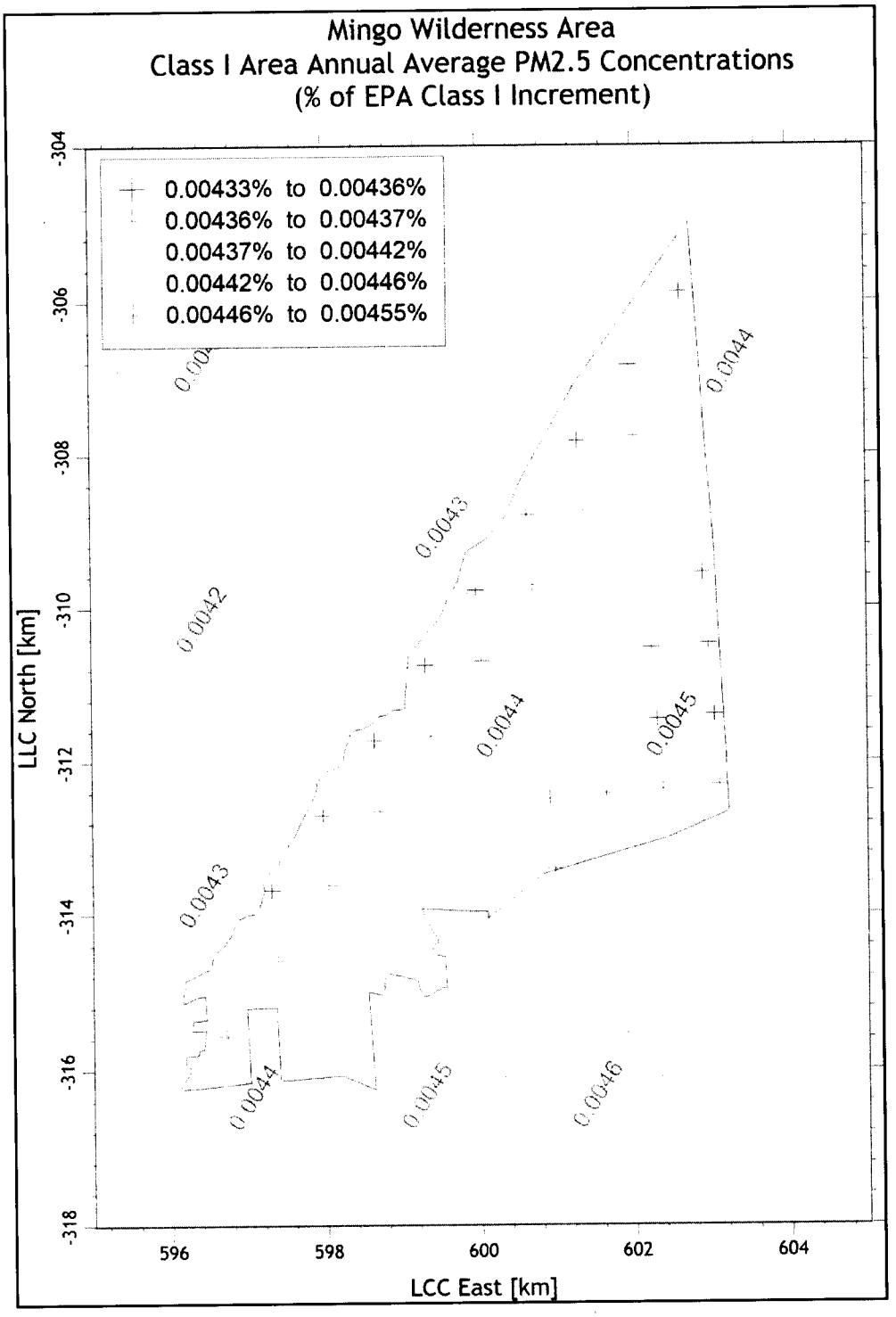

Figure 4.16 Modeled Maximum Annual $PM_{2.5}$ Concentration as Percent of PSD Class I Increment at Mingo Wilderness Area

4.2 Regional Haze CALPUFF Modeling Results

Regional haze modeling was conducted with CALPUFF using the FLAG 2010 guidance. The analysis was done using CALPOST with MVISBK = 8 and the background light extinction based on the "cleanest 20%" days for each wilderness area. The visibility threshold is exceeded if the predicted change in light extinction exceeds 5% (equivalent to a 0.5 change in deciview) based on the 98th percentile (eighth highest day for a year) in any single year modeled. The CALPUFF/CALPOST visibility results for Sipsey and Mingo Wilderness areas are presented in Tables 4-3 and 4-4, respectively.

Table 4-3

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Sipsey Wilderness Areas

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	3.03%	3.20%	2.35%	64.0
2	2.90%	2.97%	2.19%	59.4
3	2.60%	2.41%	2.07%	52.0
4	2.54%	1.69%	1.98%	50.8
5	2.41%	1.68%	1.95%	48.2
6	2.13%	1.61%	1.95%	42.6
7	1.97%	1.59%	1.64%	39.4
8	1.69%	1.41%	1.58%	33.8

Table 4-4

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Mingo Wilderness Areas

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	1.04%	0.46%	1.06%	21.2
2	0.55%	0.39%	0.99%	19.8
3	0.54%	0.37%	0.91%	18.2
4	0.52%	0.35%	0.70%	14.0
5	0.44%	0.29%	0.66%	13.2
6	0.37%	0.28%	0.51%	10.2
7	0.34%	0.25%	0.44%	8.8
8	0.30%	0.24%	0.34%	6.8

The results in Tables 4-3 and 4-4 indicate that for all three years, the 8th highest change in light extinction was well below five percent for both the Sipsey and Mingo Wilderness Areas. Therefore, the MS Silicon project does not have a significant regional haze impact and it is assumed that no further modeling is required.

4.3 Acidic Deposition CALPUFF Modeling Results

CALPUFF modeling was used to provided upper limit estimates of annual (wet and dry) deposition of sulfur and nitrogen compounds (kg/ha/yr) associated with emissions of SO_2 and NO_2 from the propose project at the Sipsey and Mingo Wilderness Areas to compare to NPS and U.S. FWS Class I Deposition Analysis Thresholds (DATs) for the Eastern Class I Areas. For the acidic deposition analysis, POSTUTIL was used to combine the wet and dry flux output files from CALPUFF and scale the contributions of SO_2, SO_4, NO_x, NO_3, and HNO_3 such that total nitrogen (N) and total sulfur (S) flux were contained in the same file. The results of the acidic deposition analysis are provided in 4-5 and 4-6 for Sipsey and Mingo Wilderness Areas, respectively.

Table 4-5

Sulfur and Nitrogen Deposition Flux Results for Sipsey Wilderness Area

Pollutant	Total Modeled Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0068	0.0087	0.0087	0.01	87.1
Nitrogen (N)	0.0028	0.0036	0.0037	0.005	73.1

Table 4-6

Sulfur and Nitrogen Deposition Flux Results for Mingo Wilderness Area

Pollutant	Total Modeled Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0010	0.0010	0.0016	0.01	16.4
Nitrogen (N)	0.0005	0.0004	0.0007	0.005	14.8

Based on the results presented in Tables 4-5 and 4-6, the modeling results indicate that the proposed project has impacts below the DAT for sulfur and nitrogen deposition at both the Sipsey and Mingo Wilderness Areas. Therefore, no additional analyses should be required.

Appendix A
CALPUFF Control Parameters and Technical Options

Variable	Description	Value
Input Group 1. General Run Control Parameters		
METRUN	Run all periods (1) or a subset (0)	0
IBYR	Beginning year	2001
IBMO	Beginning month	1
IBDY	Beginning day	1
IBHR	Beginning hour	1
XBTZ	Base Time Zone	5
IRLG	Length of Run (hours)	8760
NSPEC	Number of chemical species modeled (for MESOPUFF 11 chemistry)	7
NSE	Number of species emitted	4
ITEST	Flag to stop run after SETUP phase	2
MRESTART	Restart options (0=restart)	0
NRESPD	Number of periods in Restart output cycle	0
METFM	Format of input meteorology (1 = CALMET)	1
MPRFFM	Meteorological Profile Data Format	1
AVET	Averaging time lateral dispersion parameters (minutes)	60
PGTIME	PG Averaging Time (minutes)	60
Input Group 2. Technical Options		
MGAUSS	Near-field vertical distribution (1=Gaussian)	1
MCTADJ	Terrain adjustments to plume path (3=Plume path)	3
MCTSG	Do we have subgrid hills (0=No)	0
MSLUG	Near-field puff treatment (0= No slugs)	0
MTRANS	Model transitional plume rise (1=Yes)	1
MTIP	Treat stack tip downwash (1=Yes)	1
MDDW	Method used to simulate building downwash	1
MSHEAR	Treat vertical wind shear (0 = No)	0
MSPLIT	Allow puffs to split (0=No)	0
MCHEM	MESOPUFF-II Chemistry (1=Yes)	1
MAQCHEM	Aqueous phase transformation flag	0
MWET	Model wet deposition (1=Yes)	1
MDRY	Model dry deposition (1=Yes)	1
MTILT	Gravitational settling (plume tilt) modeled?	0
MDISP	Method for dispersion coefficients (3=PG&MP)	3
MTURBVW	Turbulence characterization (only if MDISP = 1 or 5)	3
MDISP2	Backup coefficients (only if MDISP=1 or 5)	3
MTAULY	Method for Langrangian timescale for Sigma-y	0
MTAUADV	Method used for Advective-Decay timescale for Turbulence	0
MCTURB	Method used to compute turbulence sigma-v & sigma-w using micrometeorological variables	1
MROUGH	Adjust PG for surface roughness (0=No)	0
MPARTL	Model partial plume penetration (0=No)	1
MTINV	Elevated inversion strength(0=compute from data)	0
MPDF	Use PDF for convective dispersion (0=No)	0
MSGTIBL	Use TIBL module (0=No)	0
MBCON	Boundary conditions (concentration) modeled	0
MSOURCE	Individual source contributions saved	0
MFOG	Configure for FOG Model output	0
MREG	Regulatory default checks (1=Yes)	1

Variable	Description	Value
Input Group 3. Species List		
CSPECn	Names of species modeled (for MESOPUFF II, must be SO_2, SO_4, NO_X, HNO_3, NO_3)	SO_2, SO_4, NO_X, HNO_3, NO_3, PMC, PMF
SO2	Modeled, Emitted, Dry deposition, Output group number	1,1,1,0
SO4	Modeled, Emitted, Dry deposition, Output group number	1,0,2,0
NOX	Modeled, Emitted, Dry deposition, Output group number	1,1,1,0
HNO3	Modeled, Emitted, Dry deposition, Output group number	1,0,1,0
NO3	Modeled, Emitted, Dry deposition, Output group number	1,0,2,0
PMC	Modeled, Emitted, Dry deposition, Output group number	1,1,2,0
PMF	Modeled, Emitted, Dry deposition, Output group number	1,1,2,0
Input Group 4. Grid Control Parameters		
PMAP	Map Projection	LCC
FEAST	False Easting (km) at the projection origin	0
FNORTH	False Northing (km) at the projection origin	0
ITUMZN	UTM zone (1 to 60)	-999
UTMHEM	Hemisphere for UTM projection	N
RLAT0	Latitude (decimal degrees) of projection origin	40N
RLON0	Longitude (decimal degrees) of projection origin	97W
XLAT1	Matching parallel(s) of latitude (decimal degrees) for projection	33N
XLAT2	Matching parallel(s) of latitude (decimal degrees) for projection	45N
DATUM	Datum-region for output coordinates	NWS-84
NX	Number of east-west grids of input meteorology	Domain 1 (116), Domain 3 (263)
NY	Number of north-south grids of input meteorology	Domain 1 (182), Domain 3 (185)
NZ	Number of vertical layers of input meteorology	10
DGRIDKM	Meteorology grid spacing (km)	4
ZFACE	Vertical cell face heights of input meteorology	0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000
XORIGKM	Southwest corner (east-west) of input meteorology	Domain 1 (478.004), Domain 3 (538.004)
YORIGIM	Southwest corner (north-south) of input meteorology	Domain 1 (-1177.998), Domain 3 (-637.997)
IBCOMP	Southwest X-index of computational domain	1
JBCOMP	Southwest Y-index of computational domain	1
IECOMP	Northeast X-index of computational domain	Domain 1 (116), Domain 3 (263)
JECOMP	Northeast Y-index of computational domain	Domain 1 (182), Domain 3 (185)
LSAMP	Use gridded receptors (T=Yes)	F
IBSAMP	Southwest X-index of receptor grid	1
JBSAMP	Southwest Y-index of receptor grid	1
IESAMP	Northeast X-index of receptor grid	Domain 1 (116), Domain 3 (263)
JESAMP	Northeast Y-index of receptor grid	Domain 1 (182), Domain 3 (185)
MESHDN	Gridded receptor spacing = DGRIDKM/MESHDN	1

Variable	Description	Value
Input Group 5. Output Options.		
ICON	Output Concentrations (1=Yes)	1
IDRY	Output dry deposition flux (1=Yes)	1
IWET	Output wet deposition flux (1=Yes)	1
IT2D	Output 2D Temperature	0
IRHO	Output 2D Density	0
IVIS	Output RH for visibility calculations (1=Yes)	1
LCOMPRS	Use compression option in output (T=Yes)	T
IQAPLOT	Create a standard series of output files	1
IMFLX	Mass flux across specified boundaries for selected species reported hourly	0
IMBAL	Mass balance for each species reported hourly	0
ICPRT	Print concentrations (0=No)	0
IDPRT	Print dry deposition fluxes (0=No)	0
IWPRT	Print wet deposition fluzes (0=No)	0
ICFRQ	Concentration print interval (1=hourly)	1
IDFRQ	Dry flux print interval (1=hourly)	1
IWFRQ	Wet flux print interval (1=hourly)	1
IPRTU	Print output units	3
IMESG	Status messages to screen (1=Yes)	2
Ouput Species	Species Output Options (All species)	0, 1, 0, 1, 0, 1, 0
LDEBUG	Turn on debug tracking (F=no)	F
IPFDEB	First puff to track	1
NPFDEB	Number of puffs to track	1
NN1	Met period to start output	1
NN2	Met period to end output	10
Input Group 6. Subgrid Scale Complex Terrain Inputs		
NHILL		0
NCTREC		0
MHILL		2
XHILL2M		1
ZHILL2M		1
XCTDMKM		0
YCTDMKM		0
Input Group 7. Chemical Parameters for Dry Deposition of Gases		
SO2	Diffusivity, Alpha Star, Reactivity, Mesophyll Resistance, Henry's Law	0.1509, 1000, 8, 0, 0.04
NOX	Diffusivity, Alpha Star, Reactivity, Mesophyll Resistance, Henry's Law	0.1656, 1, 8, 5, 3.5
HNO3	Diffusivity, Alpha Star, Reactivity, Mesophyll Resistance, Henry's Law	0.1628, 1, 18, 0, 0.0000001
Input Group 8. Size Parameters for Dry Deposition of Particles		
SO4		0.48, 2.0
NO3		0.48, 2.0
PMC		6.0, 2.0
PMF		0.48, 2.0
Input Group 9. Miscellaneous Dry Deposition of Parameters		
RCUTC	Reference cuticle resistance (s/cm)	30
RGR	Reference ground resistance (s/cm)	10
REACTR	Reference reactivity	8
NINT	Number of particle-size intervals	9
IVEG	Vegetative state (1=active and unstressed)	1
Input Group 10. Wet Deposition Parameters		
SO2	Liquid Precip., Frozen Precip	3.0E-5, 0.0E00
SO4	Liquid Precip., Frozen Precip	1.0E-04, 3.0E-05
HNO3	Liquid Precip., Frozen Precip	6.0E-05, 0.0E00
NO3	Liquid Precip., Frozen Precip	1.0E-04, 3.0E-05
PMC	Liquid Precip., Frozen Precip	1.0E-04, 3.0E-05
PMF	Liquid Precip., Frozen Precip	1.0E-04, 3.0E-05

Variable	Description	Value
Input Group 11. Chemistry Parameters		
MOZ	Ozone background (1=read from ozone.dat)	1
BCKO3	Ozone default (ppb) (Use only for missing data)	12*60
BCKNH3	Ammonia background (ppb)	12*2
RNITE1	Nighttime SO_2 loss rate (%/hr)	0.2
RNITE2	Nighttime NO_x loss rate (%/hr)	2
RNITE3	Nighttime HNO_3 loss rate (%/hr)	2
MH202	H2O2 data input option	1
BCKH202	H202	12*1
BCKPMF	Clean Continental	12*1
OFRAC		0.15, 0.15, 0.20 ,0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.15
VCNX		12*50
Input Group 12 Misc. Dispersion and Computational Parameters		
SYTDEP	Horizontal size (m) to switch to time dependence	550
MHFTSZ	Use Heffter for vertical dispersion (0=No)	0
JSUP	PG Stability class above mixed layer	5
CONK1	Stable dispersion constant	0.01
CONK2	Neutral dispersion constant	0.1
TBD	Transition for downwash algorithms	0.5
IURB1	Beginning urban landuse type	10
IURB2	Ending urban landuse type	19
ILANDUIN	Land use category for modeling domain	20
Z0IN	Roughness length for modeling domain	0.25
XLAIIN	Leaf area index for modeling domain	3
ELEVIN	Elevation above sea level	0
XLATIN	Latitude (degrees) for met location	-999
CLONIN	Longitude (degrees) for met location	-999
ANEMHT	Anemometer height (m)	10
ISIGMAV	Form of lateral turbulance data in PROFILE.DAT file	1
IMIXCTDM	Choice of mixing heights	0
XMXLEN	Maximum length of a slug in units of DGRIDKM	1
XSAMLEN	Maximum travel distance of puff/slug during one sampling step (units of DGRIDKM)	10
MXNEW	Maximum number of puffs per hour	60
MXSAM	Maximum sampling steps per hour	60
NCOUNT	Number of iterations used when computing the transport wind	2
SYMIN	Minimum sigma y for new puff/slug	1
SZMIN	Minimum sigma z for a new puff/slug	1
SVMIN	Default minimum turbulence velocities sigma-v and sigma-w for each stability class over land and over water (m/s)	0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.500
SWMIN	Default minimum turbulence velocities sigma-v and sigma-w for each stability class over land and over water (m/s)	0.200, 0.120, 0.080, 0.060, 0.030, 0.016, 0.200, 0.120, 0.080, 0.060, 0.030, 0.016
CDIV	Divergence criteria	0.0, 0.0
WSCALM	Minimum wind speed allowed for non-calm conditions	0.5
XMAXZI	Maximum mixing height	3000
XMINZI	Minimum mixing height	20
WSCAT	Upper bounds 1st 5 wind speed classes (m/s)	1.54, 3.09, 5.14, 8.23, 10.80
PLX0	Wind speed power-law exponents	0.07, 0.07, 0.10, 0.15, 0.35, 0.55
PTGO	Potential temperature gradients PG E and F (deg/km)	0.020, 0.035
PPC	Default plume path coefficients	.5, .5, .5, .5, .35, .35
SL2PF	Maximum Sy/puff length	10
NSPLIT	Number of puffs when puffs split	3
IRESPLIT	Hours when puff are eligible to split	0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0
ZISPLIT	Previous hour=s mixing height (minimum) (m)	100
ROLDMAX	Previous Max mixing height/current mixing height ratio, must be less then this value to allow puff split	0.25
NSPLITH	Number of Puff that result when a puff is split	5

Variable	Description	Value
SYSPLITH	Minimum sigma-y of puff before it may be split	1
SHSPLITH	Minimum puff elongation rate due to wind shear, before it may be split	2
CNSPLITH	Minimum concentration (g/m3) of each species in puff before split	1.0 E-07
EPSSLUG	Convergence criterion for SLUG sampling integration	1.0 E-04
EPSAREA	Convergence criterion for AREA source integration	1.0 E-06
DSRISE	Trajectory step-length (m) used for numerical rise integration	1
HTMINBC	Minimum height(m) to which BC puffs are mixed as they are emitted.	500
RSAMPBC	Search radius (km) about a receptor gor sampling nearest BC puff	10
MDEPBC	Near-surface depletion adjustment to concentration profile used	1
Input Group 13 Point Source Parameters		
NPT1	Number of Point Sources	6
IPTU	Units used for point source emissions	1
NSPT1	Number of source-species combinations with variable emission scaling factors	0
NPT2	Number of point sources with variable emission parameters provided in file	0
SRCNAM	Source Name	SAF1
X	X, Y, Stack Height, Base Elevation, Stack Diameter, Exit Velocity, Exit Temp. Bldg. Dwash, Emission Rates	91.44, 143.59, 1.93, 19.37, 449.82, 0.0, 1.7879E01, 0.0E00, 1.5592E01, 0.0E00, 0.0E00, 4.397E-01, 4.397E-01
ZPLTFM		0
FMFAC		1
SRCNAM	Source Name	SAF2
X	X, Y, Stack Height, Base Elevation, Stack Diameter, Exit Velocity, Exit Temp. Bldg. Dwash, Emission Rates	91.44, 143.25, 1.93, 19.37, 449.82, 0.0, 1.7879E01, 0.0E00, 1.5592E01, 0.0E00, 0.0E00, 4.397E-01, 4.397E-01
ZPLTFM		0
FMFAC		1
SRCNAM	Source Name	RM1
X	X, Y, Stack Height, Base Elevation, Stack Diameter, Exit Velocity, Exit Temp. Bldg. Dwash, Emission Rates	788.60923, -537.0533, 12.19, 144.35, 1.37, 18.29, 293.15, 0.0, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 9.72E-02, 9.72E-02
ZPLTFM		0
FMFAC		1
SRCNAM	Source Name	RM2
X	X, Y, Stack Height, Base Elevation, Stack Diameter, Exit Velocity, Exit Temp. Bldg. Dwash, Emission Rates	788.62881, -537.2669, 24.384, 141.93, 1.37, 18.29, 293.15, 0.0, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 9.72E-02, 9.72E-02
ZPLTFM		0
FMFAC		1
SRCNAM	Source Name	PR1
X	X, Y, Stack Height, Base Elevation, Stack Diameter, Exit Velocity, Exit Temp. Bldg. Dwash, Emission Rates	788.56657, -537.1173, 12.19, 143.3, 1.07, 18.29, 293.15, 0.0, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 4.86E-02, 4.86E-02
ZPLTFM		0
FMFAC		1
SRCNAM	Source Name	PR2
X	X, Y, Stack Height, Base Elevation, Stack Diameter, Exit Velocity, Exit Temp. Bldg. Dwash, Emission Rates	788.57521, -537.1173,, 24.384, 143.3, 1.07, 18.29, 293.15, 0.0, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 4.86E-02, 4.86E-02
ZPLTFM		0
FMFAC		1

Variable	Description	Value
Input Group 14 Area Source Parameters		
NAR1	Number of Area Sources	2
IARU	Units used for area source emissions	1
NSAR1	Number of source-species combinations with variable emission scaling factors	0
NAR2	Number of point sources with variable emission parameters provided in file	0
SRCNAM	Source Name	PA
X	Effective Height, Base Elevation, Initial Sigma Z, Emission Rates	9.14, 140.87, 0.0, 0.0e00, 0.0e00, 0.0e00, 0.0e00, 0.0e00, 2.19E-06, 3.95E-07
XVERT	X-coordinates for area vertices	788.5561, 788.8957, 788.8897, 788.5500
YVERT	Y-coordinates for area vertices	-537.016, -537.024, -537.254, -537.245
SRCNAM	Source Name	SP
X	Effective Height, Base Elevation, Initial Sigma Z, Emission Rates	9.14, 140.79, 0.0, 0.0e00, 0.0e00, 0.0e00, 0.0e00, 0.0e00, 3.49E-06, 1.23E-06
XVERT	X-coordinates for area vertices	788.9499,, 789.0555, 789.0469, 788.9413
YVERT	Y-coordinates for area vertices	-537.111, -537.116, -537.282, -537.276
Input Group 15 Line Source Parameters		
	No Line Sources are anticipated	
Input Group 16 Volume Source Parameters		
NVL1	Number of Area Sources	4
IVLU	Units used for area source emissions	1
NSVL1	Number of source-species combinations with variable emission scaling factors	0
NVL2	Number of point sources with variable emission parameters provided in file	0
SRCNAM	Source Name	F1
X	X, Y, Effective Height, Base Elevation, Initial Sigma y, Initial Sigma z, Emission Rates	788.6559, -537.093, 20.01, 144.01, 6.97, 18.62, 1.48E-03, 0.0E00, 2.02E-01, 0.0E00, 0.0E00, 1.26E-03, 1.26E-03
SRCNAM	Source Name	F2
X	X, Y, Effective Height, Base Elevation, Initial Sigma y, Initial Sigma z, Emission Rates	788.675, -537.22, 20.01, 143.04, 6.97, 18.62, 1.48E-03, 0.0E00, 2.02E-01, 0.0E00, 0.0E00, 1.26E-03, 1.26E-03
SRCNAM	Source Name	CF1
X	X, Y, Effective Height, Base Elevation, Initial Sigma y, Initial Sigma z, Emission Rates	788.6301 -537.107, 14.0, 144.09, 5.61, 13.02, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 7.56E-04, 7.56E-04
SRCNAM	Source Name	CF2
X	X, Y, Effective Height, Base Elevation, Initial Sigma y, Initial Sigma z, Emission Rates	788.6396, -537.21, 14.0, 143.49, 5.61, 6.51, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 0.0E00, 7.56E-04, 7.56E-04
Input Group 17 Non-gridded (Discrete) Receptor Information		
	148 discrete receptors for Sipsey Wilderness 47 discrete receptors for Mingo Wilderness	

MISSISSIPPI DEPARTMENT OF
ENVIRONMENTAL QUALITY

MODELING REPORT

Mississippi Silicon LLC
Tishomingo County, MS

June 20, 2017

Prepared By:

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Water • Soils • Air • Compliance

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Attachment A – Surrounding Source Inventory

1.0 FACILITY IDENTIFICATION AND LOCATION

In November of 2013, the Mississippi Department of Environmental Quality issued a PSD Construction Permit to Mississippi Silicon, LLC located in Tishomingo County, MS. The facility is located approximately 2.5 miles south of Burnsville, MS east of Highway 365 as depicted in Figure 1.

Permit numbers currently registered for the facility.

Permit Number	Issue Date	Action Type
2640-00060	November 27, 2013	Air-Construction
MSR106475	November 1, 2013	GP-Construction

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2.0 FACILITY DESCRIPTION

The silicon manufacturing plant permitted to MS Silicon will be capable of producing a high quality, low cost silicon. The manufacturing plant will utilize four (4) semi-enclosed submerged arc furnaces (SAF) with a capacity of 2.75 tons/hr each (~45 MVA) to produce approximately 84,096 tons/year of 98-99% pure silicon metal. Only two arc furnaces are permitted to be operated at any given time. In particular, the modeling discussed in this report is limited to the NO_x and SO_2 emissions from the submerged arc furnaces and natural gas fired ladle preheaters.

2.1. PURPOSE OF MODELING

The purpose of the modeling being performed for this project is to further support the response to EPA comments made to the Mississippi Department of Environmental Quality and demonstrate that the MS Silicon facility will not cause or contribute to a modeled exceedance of the National Ambient Air Quality Standard for nitrogen dioxide and sulfur dioxide. This ambient air quality modeling report has been prepared in accordance with the "Guideline on Air Quality Modeling," EPA Memos and discussions with US EPA Region 4 modeling personnel.

3.0 MODEL INPUT OPTIONS

The latest version of AERMOD (dated 14134) was used to determine compliance with the National Ambient Air Quality Standards. AERMOD is the recommended model for a wide range of regulatory applications in all types of terrain. AERMOD is appropriate for the following applications:

- Point, volume, and area sources;
- Surface, near-surface, and elevated releases;
- Rural or urban areas;
- Simple and complex terrain;
- Transport distances over which steady-state assumptions are appropriate, up to 50km;
- 1-hour to annual averaging times; and

- Continuous toxic air emissions.

The model was executed with all regulatory default options. The DFAULT option requires the use of terrain elevation data, stack-tip downwash, sequential date checking, and does not permit the use of the model in the SCREEN mode. Additionally, the most current version of the AERMOD model imposes a restriction on the urban roughness parameter to be 1 meter for regulatory default applications. In the regulatory default mode, pollutant half life or decay options are not employed, except in the case of an urban source of sulfur dioxide where a four-hour half life is applied.

As the site is located in a rural area, urban source control options were not used.

3.1. Building Downwash and Cavity Concentrations

AERMOD accounts for building wake effects (i.e., plume downwash) based on the PRIME building downwash algorithms. A building downwash analysis using the latest version of BPIP-Prime (dated 04274) was conducted and incorporated into the modeling analysis to account for potential effluent downwash due to structures using building profile input parameters included in the MS Silicon application. The layout of the buildings in relation to stacks is depicted in Figure 2.

3.2. Point Sources

Four point sources, consisting of the submerged arc furnaces, were included in the modeling to estimate the impacts of NO_2 and SO_2 surrounding the facility. These sources are summarized in Table 1. Only two arc furnaces are permitted to be operational at any given time. Impacts were determined using the four combinations of operating scenarios with each combination included in the model as a source group. The source group with the maximum ground level impacts was included in the cumulative impact modeling and the remaining combinations were discarded.

TABLE 1 - POINT SOUCE PARAMETERS

Model ID	Desc	SO_2 Emissions g/s	NO_2 Emissions g/s	Height [m]	Diam [m]	Exit_Vel [m/s]	Exit_Temp [K]
SAF1	SAF Baghouse #1	18.02	15.59	91.44	1.929	19.37	449.817
SAF2	SAF Baghouse #2	18.02	15.59	91.44	1.929	19.37	449.817
SAF3	SAF Baghouse #3	18.02	15.59	91.44	1.929	19.37	449.817
SAF4	SAF Baghouse #4	18.02	15.59	91.44	1.929	19.37	449.817

3.3. Volume Sources

Ladle preheaters were included in the model as volume sources. There is no restriction in the permit on the operation of the ladles, i.e., both ladles can be operational at a given time. Both ladles were, therefore, included in each source group scenarios previously mentioned. The volume source parameters are summarized in Table 2.

TABLE 2 - VOLUME SOURCE PARAMETERS

Model ID	Desc	SO_2 Emissions g/s	NO_2 Emissions g/s	Height [m]	SigmaY [m]	SigmaZ [m]	Length_X [m]
F1	Furnace Ladle #1	0.0015	0.2016	19.995	6.966	9.307	29.9538

F2	Furnace Ladle #2	0.0015	0.2016	19.995	6.966	9.307	29.9538

3.4. Receptor Grid

The receptor network included in the application was used in this evaluation. The following grids of receptors were used in the significant impact analysis:

Spacing (meters)	Placement
5000	20 kilometers beyond the fence line out to 50 km
2000	Between10 to 20 kilometers from the facility
1000	Between 5 to 10 kilometers from the facility
500	Between 3 to 5 kilometers from the facility
200	Between 2 to 3 kilometers from the facility
100	Out to 2 kilometers from the facility

In addition to the receptor network described above, receptors were added at 1 kilometer spacing on the eastern side of the modeling domain in the area of elevated terrain. Receptors were processed in the Universal Transverse Mercator (UTM) coordinate system with the respective spacing described above and as pictured in Figure 3. Included in the figure are National Elevation Dataset (NED) elevation contours. Elevations equal to or greater than the elevation of the MS Silicon stacks are indicated with the red hues.

Terrain elevations based on NED files were input to the AERMOD model for each receptor. The NED files were processed in the AERMAP (Version 11103) processor to develop elevations and hill heights for the receptors.

4.0 Meteorological Data

The five year dataset provided to the applicant for the years 2007 to 2011 was used to conduct the modeling. The surface data was collected from the Tupelo Regional Airport and the upper air was collected at the Jackson International Airport. The base elevation of the Tupelo Regional Airport, 104 meters, was used in the meteorology pathway of AERMOD with the PROFBASE keyword to define the base elevation for the potential temperature profile.

The met data was provided by the MDEQ in an AERMOD ready format processed with AERMET VERSION 12345 and was supplemented with one-minute ASOS data using a threshold limit of 0.50 m/s.

5.0 Significant Impact Analysis and Cumulative Impact Analysis

5.1. Significant Impact Area (SIA)

The SIA was determined by modeling the facility emission sources included in Section 3.2 and 3.3. The first-highest 1-hour value averaged over 5 years was compared to the significance levels in Table 3. The ARM factor of 0.8 was applied to the modeled NOx values prior to comparison to the NO_2 significant impact levels and ambient air standards.

The significant impact modeling is summarized in Table 4 and depicted in Figure 4 and Figure 5. The figures indicate a 50 km radius around the facility which is the limit of the AERMOD model. Impacts of both NO_2 and SO_2 exceeded the significant impact analysis, requiring a cumulative impact analysis for both pollutants. The significant impact area was considered those receptors exceeding the significance level and the next adjacent receptor. The facility is authorized to operate only two arc furnaces at any given time. Source groups were used to determine the impacts of the different combinations of the furnaces, the ladle volume sources were included in each source group. The maximum impacts for SO_2 were determined to be when SAF1 and SAF2 were operating simultaneously. NO_2 maximum impacts were identical for each source group, indicating that the maximum impacts are controlled by the ladles for the NO_2 impacts. The cumulative impact analysis was conducted using the SAF1 and SAF2 combination.

TABLE 3 - NATIONAL AMBIENT AIR QUALITY STANDARDS AND SIGNIFICANT IMPACT LEVELS.

Pollutant	Averaging Period	Significance Level (ug/m^3)	NAAQS
Nitrogen Dioxide (NO_2)	1-hour	7.52	0.100 ppm (188 ug/m^3)
Sulfur Dioxide (SO_2)	1-hour	7.86	0.075 ppm (196.5 ug/m^3)

TABLE 4 - RADIUS OF IMPACT MODELING RESULTS

Pollutant	Averaging Period	Significant Impact Level (µg/m^3)	Modeled Results (µg/m^3)	UTM X (M)	UTM Y (M)	Figure
NO_2*	1-hour	7.52	78.59706	378886.76	3851765.89	Figure 4
SO_2	1-hour	7.86	51.98635	379965.00	3852220.00	Figure 5

*Significant Impact Area and maximum NO_2 impacts determined using ARM of 0.8.

5.2. NAAQS Modeling

5.2.1. Background

The background concentrations used to determine compliance with the NAAQS in the MS Silicon application were used in this modeling analysis. SO_2 background was considered to be 70.74 ug/m^3 and NO_2 background was considered to be 63.92 ug/m^3. Background was included in the modeling runs using the BACKGRND keyword in the source option pathway with a BGflag parameter of ANNUAL.

5.2.2. Competing Source Inventory

The modeling domain extends into Tennessee and Alabama, therefore, the competing source inventory was comprised of sources from three states. The competing sources in Tennessee and Alabama included in the application were used in this evaluation. Sources in the Mississippi inventory were evaluated to determine whether they were located within the significant impact area and, if so, were included in the analysis regardless of the 20D comparison.

5.2.2.1. SO_2 Sources

Three sources located in Mississippi included in the application were excluded because they were determined to be outside of the SIA and had emissions less than 20D. These sources were Oil Dri Production Company, TVA Magnolia Combined Cycle and Tiffin Motorhomes Inc. Several minor sources were determined to be within the SIA and were, therefore, included in the cumulative analysis. The competing source modeled emissions were based on the

potential emissions provided from the Mississippi inventory database. The modeled parameters are summarized in Table 5.

TVA Colbert is under a Consent Decree to shut down certain units at the facility. Unit No. 5 is to be shut down by December 31, 2015. This unit was included in the first two years of modeled data. This includes the unit for over a third of the modeled period. The basis for modeling in this fashion is the standard is a three year average and the unit could only possibly operate less than one-third of the standard averaging period simultaneously with MS Silicon. Units 1-4 are to be shut down by June 30, 2016, which is half of the standard averaging period. These units were included in the first two and a half years of the modeled period. During the third year, the variable emissions option was used to set the emissions for Units 1-4 to zero for the months July through December. Units 1-5 emissions were set to zero for the last two years of the modeled period.

TABLE 5 - SO2 COMPETING SOURCES

Facility	Model ID	Emission_Rate [g/s]	Height [m]	Diam [m]	Exit_Vel [m/s]	Exit_Temp [K]
Kingsford Manufacturing	35101	2.157083715	31.09	3.505	23.1953	1033.15
	KMC2	0.004890411	3.048	0.3048	0.001	0
Packaging Corporation of America	TN2SB1213	0.006299894	48.77	2.438	14.9657	488.706
	TN2ST1198	42.80525996	76.2	3.901	12.2225	435.928
	TN2ST6009	0.149937478	22.86	1.219	13.4722	344.261
	TN2ST6025	0.023939597	22.86	1.372	8.13816	339.261
	TN2ST7214	12.41835111	54.41	2.591	16.4592	455.372
	TN2ST7215	0.440992582	54.56	3.353	22.2809	433.15
	TN2ST7216	12.41835111	76.2	2.438	19.2024	469.261
	TN2ST7217	0.413273048	54.56	1.219	13.4112	333.15
	TN2ST7225	0.251995761	16.15	1.097	17.1907	354.261
	TN2ST7236	0.11591805	54.56	1.219	13.4112	333.15
TVA Colbert	ALMMMM	2351.624443	183.5	8.016	27.6758	424.817
	ALX001	53.928	9.693	3.871	44.2265	777.039
	ALX013	2795.640974	152.4	7.224	23.1343	417.039
	STCK1	53.928	9.693	3.871	44.2265	777.039
	STCK2	53.928	9.693	3.871	44.2265	777.039
	STCK3	53.928	9.693	3.871	44.2265	777.039
	STCK4	53.928	9.693	3.871	44.2265	777.039
	STCK5	53.928	9.693	3.871	44.2265	777.039
	STCK6	53.928	9.693	3.871	44.2265	777.039
	STCK7	53.928	9.693	3.871	44.2265	777.039
Caterpillar Inc	CAT1	0.000863014	3.048	0.3048	0.001	0
	CAT2	0.000287671	11.28	0.3048	4.572	366.48333
	CAT3	0.000575342	11.58	0.7102	12.7102	304.26111
	CAT4	0.000287671	12.5	0.3566	1.9812	366.48333
	CAT5	0.055232877	12.5	0.4054	0.9144	366.48333
	CAT6	0.018410959	12.5	0.4054	0.9144	394.26111
	CAT7	0.000575342	14.33	0.2042	5.334	366.48333
	CAT8	0.000575342	14.33	0.4572	7.10184	347.03889
Columbia Gulf Transmission	CGT1	0.002876712	3.658	0.0518	47.305	810.92778
	CGT2	0.002013699	4.572	0.2042	39.624	755.37222

Facility	Model ID	Emission_Rate [g/s]	Height [m]	Diam [m]	Exit_Vel [m/s]	Exit_Temp [K]
	CGT3	0.025890411	6.706	3.6363	15.3924	672.03889
	CGT4	0.011506849	12.19	0.6096	37.3685	810.92778
	CGT5	0.014383562	18.29	2.7523	16.4897	688.70556
Ergon Asphalt and Emulsions	ERGON1	0.48006	4.572	0.6605	4.45008	644.26111
	ERGON2	0.48006	3.658	0.3048	5.24256	644.26111
Ershigs, Inc.	ERSHING	0.008630137	4.572	0.3048	0.001	0
International Converter	IC1	0.000575342	3.048	0.3048	0.001	0
	IC2	0.000287671	9.144	0.762	7.62	394.26111
	IC3	0.000575342	10.67	0.7102	13.716	477.59444
	IC4	0.000863014	10.67	0.7803	10.668	490.37222
	IC5	0.000287671	10.67	0.8412	5.7912	408.15
	IC6	0.000863014	11.58	1.146	8.2296	491.48333
Kimberly Clark Corporation	KC1	0.042287671	3.048	0.3048	0.001	0
	KC2	0.000287671	3.048	0.5578	6.858	477.59444
	KC3	0.000287671	3.048	0.5578	8.01624	477.59444
	KC4	0.002876712	3.048	0.6614	13.5026	467.03889
	KC5	0.000575342	3.048	2.7432	12.3749	308.70556
	KC6	0.002876712	11.28	0.9144	13.5026	477.59444
	KC7	0.000287671	12.19	0.3566	9.2964	505.37222
Metal Exporters Inc.	ME1	0.94122	10.67	0.4572	28.7457	394.26111
	ME2	0.94122	10.67	0.6096	24.256	310.92778
	ME3	0.000252	10.67	0.3048	6.46786	310.92778
Mississippi Polymers	MP1	0.003452055	3.048	0.3048	0.001	0
	MP2	0.000575342	4.267	0.4054	7.62	463.70556
	MP3	0.001150685	11.89	0.509	12.131	672.03889
Timber Products Company	TIMPROD	0.003739726	3.048	0.3048	0.001	0
Tishomingo Acquisition LLC	TISHACQ	0.000575342	3.048	0.3048	0.001	0
Water Way, Inc.	WW	0.000287671	3.048	0.3048	0.001	0

5.2.2.2. NO_2 Sources

As with the SO_2 sources, the NO_2 sources in the Mississippi inventory were evaluated using the 20D rule and also whether they were within the MS Silicon significant impact area. Two sources excluded by the 20D Rule, Metal Exporters and Water Way, were identified as being within the significant impact area. Prior to running the analysis, it was discovered that Metal Exporters is out of business and no longer holds a permit, therefore, this source was not included in the analysis.

TVA Colbert was only modeled for part of the five year period due to the consent decree requiring some of the units to be shut down. Unit No. 5 was modeled for the first two years and then emissions were set to zero. Unit Nos. 1 through 4 were modeled for the first two and one-half years and then emissions were set to zero for these units.

The off-site sources included in the analysis are summarized in Table 6

TABLE 6 - NOX OFF-SITE INVENTORY

Facility	Model ID	Emission_Rate [g/s]	Height [m]	Diam [m]	Exit_Vel [m/s]	Exit_Temp [K]
Columbia Gulf Transmission	CGT1	0.12369863	3.658	0.0518	47.305	810.92778
	CGT2	0.017260274	4.572	0.2042	39.624	755.37222
	CGT3	12.06205479	6.706	3.6363	15.3924	672.03889
	CGT4	137.4147945	12.19	0.6096	37.3685	810.92778
	CGT5	2.833561644	18.29	2.7523	16.4897	688.70556
	CGT6	0.149589041	3.962	0.0396	102.657	810.92778
Kingsford Manufacturing Company	KMC2	0.085150685	3.048	0.3048	0	0
	KMC3	0.014958904	6.096	0.6096	16.1849	422.03889
	35101	9.349315068	31.09	3.5052	23.1953	1033.15
Tennessee Gas Pipeline Company, New Albany	TGPC1	0.013808219	3.048	0.3048	0	0
	TGPC2	23.60658904	6.706	0.6096	28.6512	674.81667
	TGPC3	2.805945205	7.925	0.2042	47.8231	644.26111
	TGPC4	22.07819178	7.925	0.509	32.004	700.37222
	TGPC5	6.258863014	9.144	0.4572	41.4223	674.81667
Water Way	WW1	0.041712329	3.048	0.3048	0	0
Packaging Corporation of America	TN2SB1213	2.717774284	48.77	2.438	14.9657	488.706
	TN2ST1198	24.94632037	76.2	3.901	12.2225	435.928
	TN2ST6009	0.713148004	22.86	1.219	13.4722	344.261
	TN2ST6025	0.521631226	22.86	1.372	8.13816	339.261
	TN2ST7214	2.351120451	54.41	2.591	16.4592	455.372
	TN2ST7215	10.5283829	54.56	3.353	22.2809	433.15
	TN2ST7216	2.351120451	76.2	2.438	19.2024	469.261
TVA Colbert	ALMMMM	534.7350051	183.5	8.016	6.919	424.817
	ALX001	64.63691273	9.693	3.871	44.2265	777.039
	ALX013	349.5181207	152.4	7.224	23.1343	417.039
	STCK1	64.63691273	9.693	3.871	44.2265	777.039
	STCK2	64.63691273	9.693	3.871	44.2265	777.039
	STCK3	64.63691273	9.693	3.871	44.2265	777.039
	STCK4	64.63691273	9.693	3.871	44.2265	777.039
	STCK5	64.63691273	9.693	3.871	44.2265	777.039
	STCK6	64.63691273	9.693	3.871	44.2265	777.039
	STCK7	64.63691273	9.693	3.871	44.2265	777.039
Cherokee Nitrogen Company	7010013002	17.72916177	15.39	1.219	16.5506	449.817
	7010013006	1.15036065	12.19	1.067	19.812	554.261
	7010013023	9.320063225	30.48	1.219	20.2692	422.039
	7010013001B	10.59012186	21.34	2.438	3.10896	477.039
Tx Eastern Trans-Barton	7010041001	21.59099681	5.486	3.139	28.4988	777.039
Wise Alloys Plant	WAPX001	4.031932178	15.24	1.829	0.00701	449.817
	WAPX048	0.26333557	15.24	0.701	2.37744	464.261
	WAPX051	0.408233133	16.46	0.914	4.48056	464.261
	WAPX052	0.856785588	15.24	1.981	9.6012	472.039
	WAPX052A	0.856785588	13.11	2.347	15.1181	504.817
	WAPX053	1.310377958	18.29	2.134	20.3606	477.039

Facility	Model ID	Emission_Rate [g/s]	Height [m]	Diam [m]	Exit_Vel [m/s]	Exit_Temp [K]
	WAPX058	29.29450723	30.48	1.768	11.1252	977.039
	WAPX063	1.889968208	30.48	1.463	5.54736	699.817
	WAPX069	0.277195337	15.24	0.61	4.38912	464.261
	WAPX071	0.248215825	16.46	0.914	4.48056	464.261
	WAPX073	0.541790886	5.944	0.61	11.0642	494.261
	WAPX099A	2.419159307	15.55	1.311	152.4	533.15
	WAPX103	0.604789827	18.23	1.067	15.8496	533.15
	WAPX104	0.166317202	15.24	0.701	2.37744	464.261
	WAPX105	0.26333557	15.24	0.61	3.13944	464.261
	WAPX110	0.942464147	16.15	0.975	3.2004	490.928
	WAPX111	1.693411515	16.15	0.975	12.8626	490.928
	WAPX112	0.546830802	13.32	1.189	2.34696	504.817
	WAPX117	0.541790886	5.944	0.61	11.0642	494.261
	WAPX118	0.201596609	4.572	0.457	6.06552	365.928

5.2.3. Cumulative Impact Receptor Network

The cumulative impact receptor network was based upon the significant impact receptor network. The receptors determined to be significant in the significant impact analysis were retained as well as the next receptor out in all directions from the significant receptor. Figure 6 illustrates the receptor network for the SO_2 cumulative impact and Figure 7 illustrates the NO_2 cumulative impact receptor network. MS Silicon significant receptors are indicated by the dark squares and the retained receptors are green crosses.

5.2.4. AAQS Modeling Results

Compliance with the air quality standards was determined by adding the background within the model. To account for the shutdown of the TVA Colbert Units, each year was modeled separately and the individual years 4th highest maximum daily impact were averaged by receptor to obtain the 5-year average for SO_2, the individual years 8th highest maximum daily impact were used for NO_2. Impacts were found to be above the NAAQS as summarized in Table 7 and a culpability analysis was required for both NO_2 and SO_2.

TABLE 7 - AAQS MODELING RESULTS

Pollutant	Averaging Period	NAAQS/ NMAAQS ($\mu g/m^3$)	Modeled Results ($\mu g/m^3$)	UTM X (M)	UTM Y (M)
NO_2*	1-hour	188	886.99	418965	3838020
SO_2	1-hour	196.5	1075.80	416965	3839020

*Modeled NOx results adjusted by ARM of 0.8 to determine NO_2 impact.

6.0 Culpability Analysis

6.1. SO_2 Contribution

Receptors from the NAAQS analysis where violations of the SO_2 1-hour standard were identified were included in an analysis to determine source contributions to the violations. A source group for each competing source was included in the analysis to determine which sources might contribute to modeled violations. Figure 8 illustrates the culpability

grid along with the location of competing sources. These receptors represent locations from the NAAQS analysis where exceedances of the NAAQS were identified. The maximum source contributions to an exceedance are summarized in Table 8. These contributions are the maximum of any exceedance and do not represent the same receptor or rank of exceedance.

TABLE 8 - MAXIMUM CONTRIBUTION TO SO2 EXCEEDANCE (COARSE GRID)

Facility	Max Contribution to a Predicted Exceedance (ug/m3)
MS Silicon	0.195888
Kingsford	0.009182
Metal Exporters	2.24194
MS Polymers	0.00005
Kimberly Clarke	0.000648
TVA Colbert	1004.864008
Caterpillar	0.000582
Columbia Gulf	0.000896
Ergon	0.238076
Ershing	0.013152
International Converter	0.00005
Timber Products	0.000038
Tishomingo Acquisitions	0.000006
Packaging Corporation	22.512486
Water Way	0.00057
Background	70.74

EPA requested that all exceedances be defined within 100 meter spacing. A 10 receptor by 10 receptor 100-meter grid was placed around each receptor where an exceedance of the SO_2 standard was predicted. This provided full 100-meter coverage in the area of elevated terrain on the eastern side of the modeling domain. This fine receptor grid results in 125,200 receptors as pictured in Figure 9. Predicted exceedances of the standard were anticipated from the TVA Colbert plant for over one hundred of the impact ranks at each receptor. This coupled with conducting the analysis by individual years would result in tens of millions of records to manage for each year of the analysis. To reduce the amount of records to be managed, the significance analysis was run again on the refined grid. Receptors where MS Silicon did not have a significant impact were discarded. Additionally, receptors which were greater than 50 kilometers, the extent of the AERMOD model, were discarded. The resulting receptor network is pictured in Figure 10.

The culpability analysis with the previously described fine receptor grid was performed with source groups for MS Silicon and TVA Colbert. Source groups were not used for the remaining facilities to reduce the required computer memory. The maximum contributions to predicted exceedances are summarized in Figure 9. Again, these values do not occur at the same receptor/exceedance rank, but represent the maximum of all exceedances. The maximum contribution to an exceedance for both MS Silicon and TVA Colbert increased from the course to the fine grid analysis. This difference is attributable to the impacts occurring in complex terrain southeast of MS Silicon and southwest of TVA Colbert, i.e. the initial spacing was not sufficient to account for the terrain changes.

TABLE 9 - SO2 CULPABILITY SOURCE CONTRIBUTIONS FINE GRID

Facility	Max Contribution to a Predicted Exceedance (ug/m3)
MS Silicon	7.78839
TVA Colbert	1254.370408
Other Sources	26.296754
Background	70.74

The MS Silicon contribution to predicted exceedances is below the EPA significant impact level of 7.86 ug/m^3. The MS Silicon contributions of greater than 1 ug/m^3 to predicted exceedances are pictured in Figure 11. These maximum contributions are located in the elevated terrain to the southeast of the facility and are within areas of full 100-meter spacing. The five year summary of these contributions are identified in Table 12, with the total being inclusive of the background monitored value.

6.2. NO_2 CONTRIBUTION

Receptors from the initial NAAQS analysis where violations of the NO_2 1-hour standard were identified were included in an analysis to determine source contributions to the violations. A source group for each competing source was included in the analysis to determine which sources might contribute to modeled exceedances. The maximum contribution to the predicted exceedances are summarized in Table 10.

TABLE 10 - MAXIMUM CONTRIBUTION TO PREDICTED EXCEEDANCE OF NO2 1-HR STANDARD

Facility	Max Contribution to a Predicted Exceedance (ug/m3)
MS Silicon	4.398456
Kingsford	657.076526
Cherokee Nitrogen	241.278758
Texas Eastern Trans	4.796566
TVA Colbert	822.850778
Columbia Gulf	625.424212
Tenn. Gas Pipeline	13.750358
Packaging Corp	5.657428
Wise Alloy Plant	51.627158
Water Way	0.138922
Background	63.92

Receptor spacing was expanded around each receptor with a predicted exceedance in the initial NAAQS analysis to 100-meter spacing out half the distance of the current receptor spacing. The only source groups included in this analysis were MS Silicon and the source group ALL to prevent exceeding memory capability. The summary of the maximum contribution to an exceedance is included in Table 11. The location of MS Silicon contributions greater than 1 ug/m^3 to NO_2 impacts is depicted in Figure 12. A larger scale view is depicted in Figure 13, showing the maximum contribution as a red star. Gray squares indicate locations where the receptor had cumulative impacts greater than the NO_2 NAAQS. The top ten contributions to a modeled exceedance of the NO2 NAAQS by MS Silicon are summarized in Table 13. Although the expanded receptor grid did not encompass the predicted exceedance with non-violating receptors out to 100-meters, there are receptors within 300 meters with no violations.

TABLE 11 - REFINED GRID CONTRIBUTION TO MODELED EXCEEDANCE

Facility	Max Contribution to a Predicted Exceedance (ug/m3)
MS Silicon	5.378944
Surrounding Sources	1369.740066
Background	63.92

Because the maximum contribution from MS Silicon fell on the edge of the area where 100-meter spacing was used, the grid was expanded in that area. The years were not modeled individually and TVA Colbert was included with potential emissions over the 5-year period. The results show that the maximum contribution by MS Silicon to a modeled exceedance was 6.0 ug/m^3. Figure 14 depicts the location of the maximum contribution by MS Silicon. The red circle denotes the location of the maximum before the grid was expanded. Note that the predicted high at this location is greater than that previously reported because TVA emissions were included in every year of the five-year period. The shaded area indicates the area where a modeled exceedance of the standard was predicted. The labeled values are the maximum contribution from MS Silicon from any rank of modeled exceedance.

TABLE 12 - MS SILICON MAXIMUM CONTRIBUTION TO PREDICTED SO2 EXCEEDANCE

UTM X	UTM Y	Rank	Silicon 2007	TVA 2007	All 2007	Silicon 2008	TVA 2008	All 2008	Silicon 2009	TVA 2009	All 2009	Silicon 2010	TVA 2010	All 2010	Silicon 2011	TVA 2011	All 2011	Silicon 5yr Avg	TVA 5yr Avg	All 5yr Avg
414465	3841020	38TH	0.04	180.47	251.30	0.02	237.20	307.99	0.00	140.74	211.50	38.88	2.85	112.85	0.00	64.68	135.43	7.79	125.19	203.81
414365	3841020	37TH	0.11	184.32	255.35	0.09	240.39	311.39	0.03	131.87	202.69	37.96	2.84	111.91	0.00	66.96	137.71	7.64	125.28	203.81
414565	3841020	40TH	0.02	179.97	250.75	0.01	240.40	311.19	0.02	136.58	207.38	36.99	2.81	110.91	0.00	56.14	126.88	7.41	123.18	201.42
415365	3841820	41ST	0.03	194.50	265.32	0.01	244.37	315.14	0.00	112.12	182.87	33.96	1.86	106.79	0.00	49.71	120.45	6.80	120.51	198.12
415865	3842020	43RD	0.08	201.67	272.64	0.02	242.65	313.44	0.00	101.55	172.30	33.34	1.94	106.27	0.00	50.74	121.49	6.69	119.71	197.23
414865	3834720	57TH	0.03	207.42	278.24	0.01	285.48	356.29	0.05	210.12	281.00	30.82	1.38	103.10	0.01	224.78	295.55	6.18	185.84	262.84
416765	3839220	57TH	0.01	212.28	283.04	0.01	372.28	443.05	0.02	270.06	340.84	30.64	1.60	103.19	0.00	148.39	219.13	6.13	200.92	277.85
415465	3836120	57TH	0.05	237.68	308.54	0.02	346.02	416.82	0.02	302.54	373.35	29.19	0.78	100.81	0.03	304.71	375.55	5.86	238.34	315.01
414865	3834620	57TH	0.03	210.76	281.57	0.01	286.84	357.65	0.01	202.55	273.33	28.91	0.66	100.40	0.01	256.17	326.95	5.79	191.39	267.98
412265	3832220	57TH	0.00	162.75	233.51	0.01	228.38	299.15	0.01	161.64	232.45	27.30	1.42	99.62	0.01	155.20	226.00	5.47	141.88	218.14
415065	3834820	57TH	0.02	219.68	290.47	0.02	326.40	397.19	0.00	214.69	285.44	26.92	0.68	98.43	0.01	305.28	376.06	5.40	213.34	289.52
415865	3837020	78TH	0.03	139.45	210.27	0.01	234.76	305.54	0.02	164.95	235.75	0.01	129.87	200.66	26.31	0.95	98.11	5.28	134.00	210.07
415165	3834020	75TH	0.00	125.39	196.14	0.01	200.81	271.58	0.03	140.58	211.41	0.01	150.03	220.83	16.97	0.46	88.25	3.41	123.45	197.64
415765	3835920	75TH	0.01	147.22	217.98	0.02	269.09	339.89	0.04	175.34	246.27	0.02	208.54	279.33	16.89	0.51	88.22	3.40	160.14	234.34
415165	3835220	78TH	0.01	134.37	205.13	0.04	249.78	320.66	0.01	160.18	230.95	0.02	186.60	257.38	15.88	0.35	87.03	3.19	146.26	220.23
416065	3836320	75TH	0.05	150.69	221.56	0.01	275.67	346.43	0.00	162.72	233.47	0.01	181.14	251.92	13.58	0.89	85.41	2.73	154.22	227.76
415965	3835920	75TH	0.05	144.29	215.16	0.02	265.08	335.87	0.00	146.29	217.04	0.02	176.28	247.11	13.17	0.26	84.23	2.65	146.44	219.88
415165	3836120	78TH	0.01	126.00	196.77	0.00	226.87	297.62	0.03	150.50	221.32	0.00	125.64	196.39	12.99	0.67	84.51	2.61	125.94	199.32

TABLE 13 - TOP TEN MS SILICON CONTRIBUTIONS TO A MODELED EXCEEDANCE OF THE NO2 NAAQS.

x	y	Rank	Silicon 2007	All 2007	Silicon 2008	All 2008	Silicon 2009	All 2009	Silicon 2010	All 2010	Silicon 2011	All 2011	Silicon 5-yr Avg	All 5-yr Avg
381565	3846420	12TH	2.41722	187.2249	2.19216	228.5719	18.24467	137.354	1.8227	228.057	2.21797	170.1538	5.378944	190.2723
381765	3846020	12TH	1.95542	186.5159	2.13516	227.9523	17.15318	135.1598	1.56037	228.4659	1.79621	166.7905	4.920068	188.97689
373665	3852820	18TH	0.00055	251.1337	0.00359	212.7812	0.00427	126.4519	0.00177	228.7708	23.77017	128.5266	4.75607	189.53283
381765	3845920	12TH	2.33518	194.221	1.98075	228.6338	17.03874	135.5741	1.22667	215.1604	0.9718	170.0311	4.710628	188.72408
381865	3845720	8TH	4.57462	189.2286	4.86011	191.6561	3.63831	198.5237	5.85675	193.4129	4.58846	176.4317	4.70365	189.85061
381765	3845520	13TH	0.35012	200.6464	1.29726	243.9642	16.39772	136.7854	2.3795	221.0597	2.52363	155.1532	4.589646	191.52178
381665	3846220	8TH	4.48591	199.8747	4.41367	204.6712	3.81624	213.5461	5.26432	196.5375	4.95695	189.1559	4.587418	200.75708
373665	3852920	17TH	0.00056	252.8662	0.00458	206.1294	0.00634	137.6631	0.00149	239.9202	22.49298	127.2003	4.50119	192.75583
381465	3846020	13TH	0.18124	175.3002	0.26949	242.1014	17.56022	139.9545	1.79574	229.3548	2.11224	163.13	4.383786	189.96819
381465	3845920	13TH	0.64779	172.8927	0.58772	236.6421	17.28878	140.0533	1.55616	234.7682	1.80021	166.4681	4.376132	190.16487

7.0 CONCLUSIONS

The modeling performed indicates the air quality within the modeling domain of the MS Silicon facility is impacted by surrounding sources above the SO_2 and NO_2 1-hour NAAQS. The MS Silicon contribution to each predicted exceedance is below the EPA modeling significance level and does not, therefore, cause or contributed to any modeled exceedance.

Figures

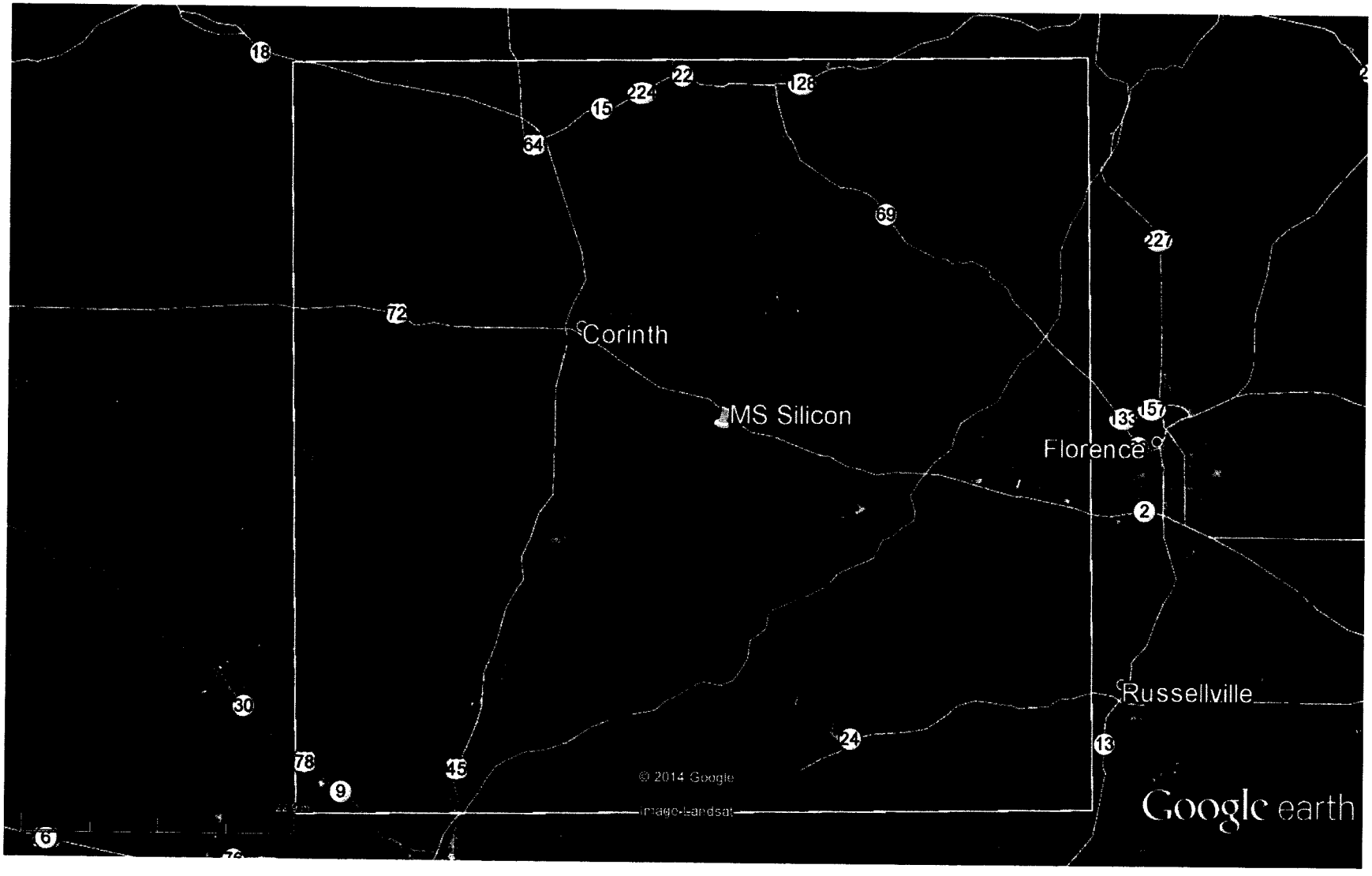


FIGURE 1 – FACILITY LOCATION

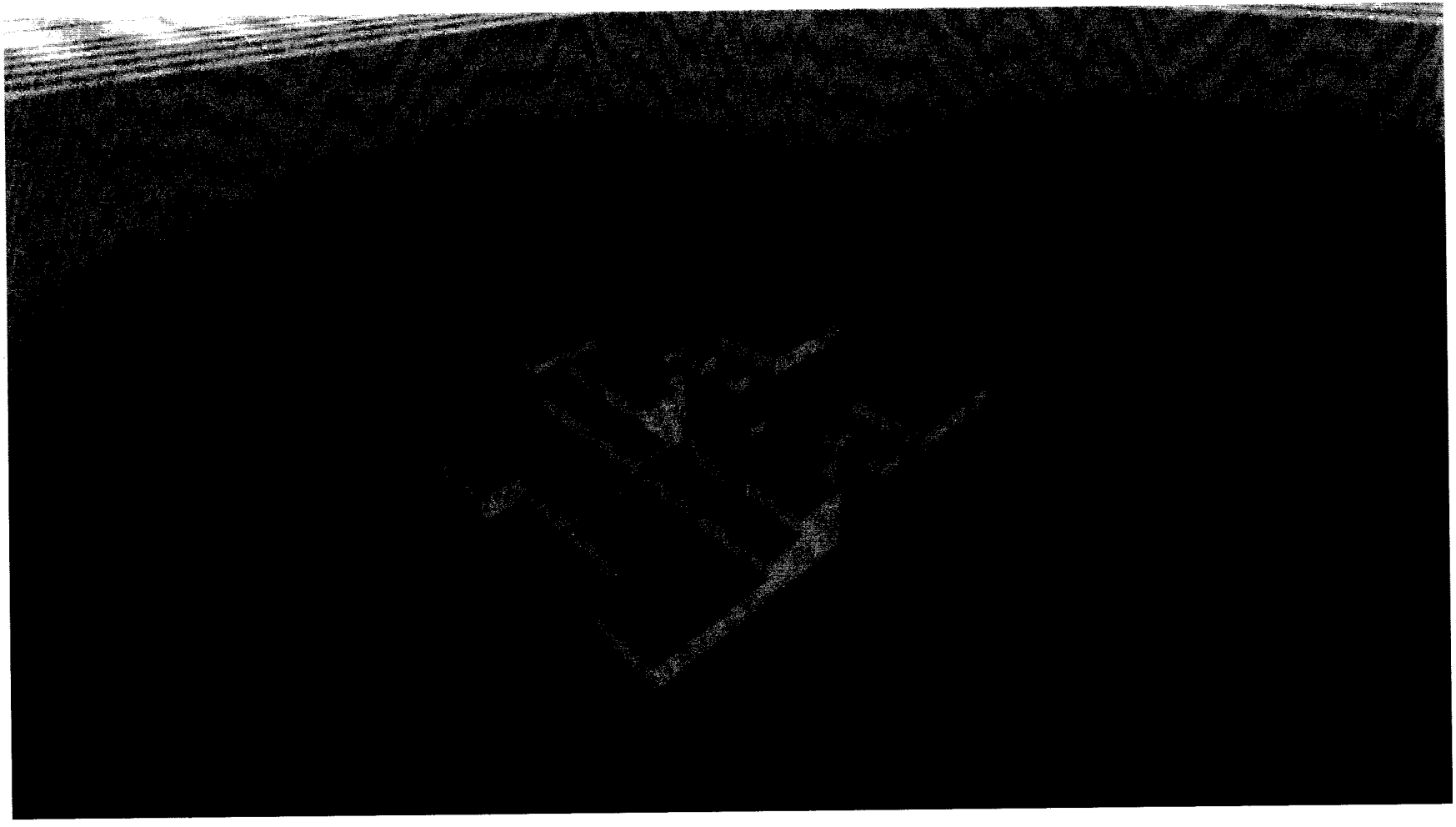


FIGURE 2 - SITE BUILDING LAYOUT

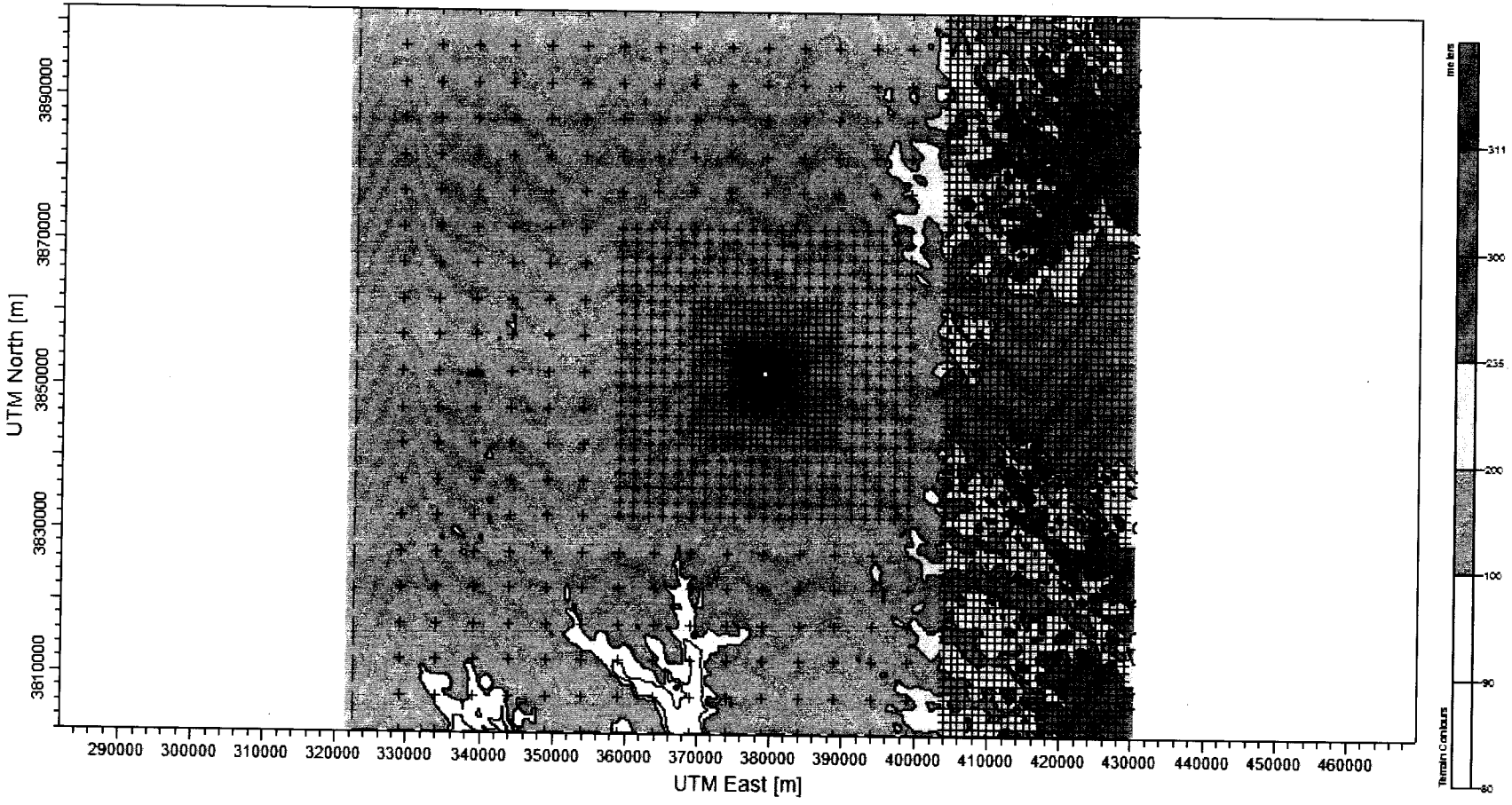


FIGURE 3 - MODELING DOMAIN WITH RECEPTOR NETWORK AND NED ELEVATONS

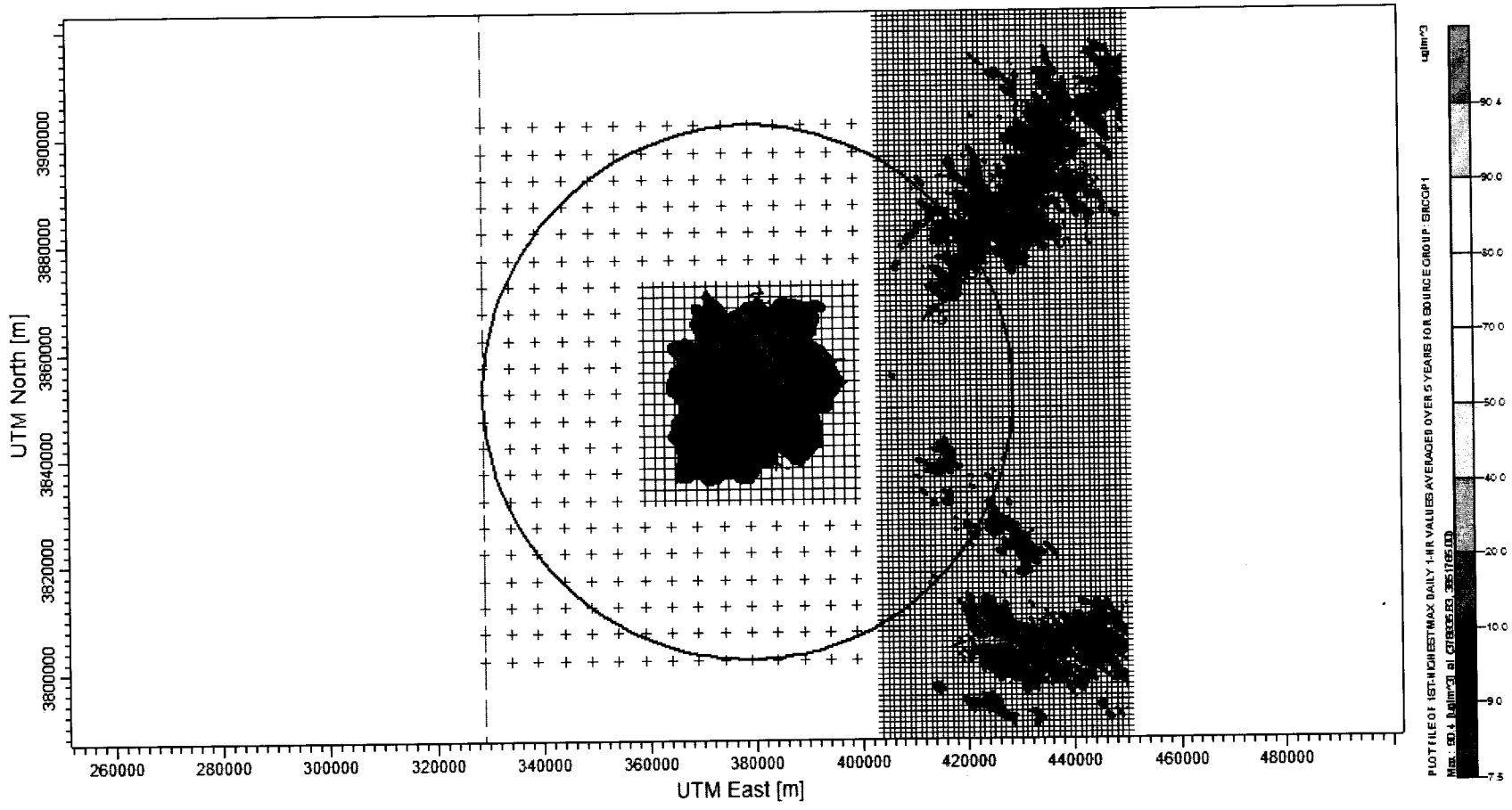


FIGURE 4 - NO_2 SIGNIFICANT IMPACT AREA

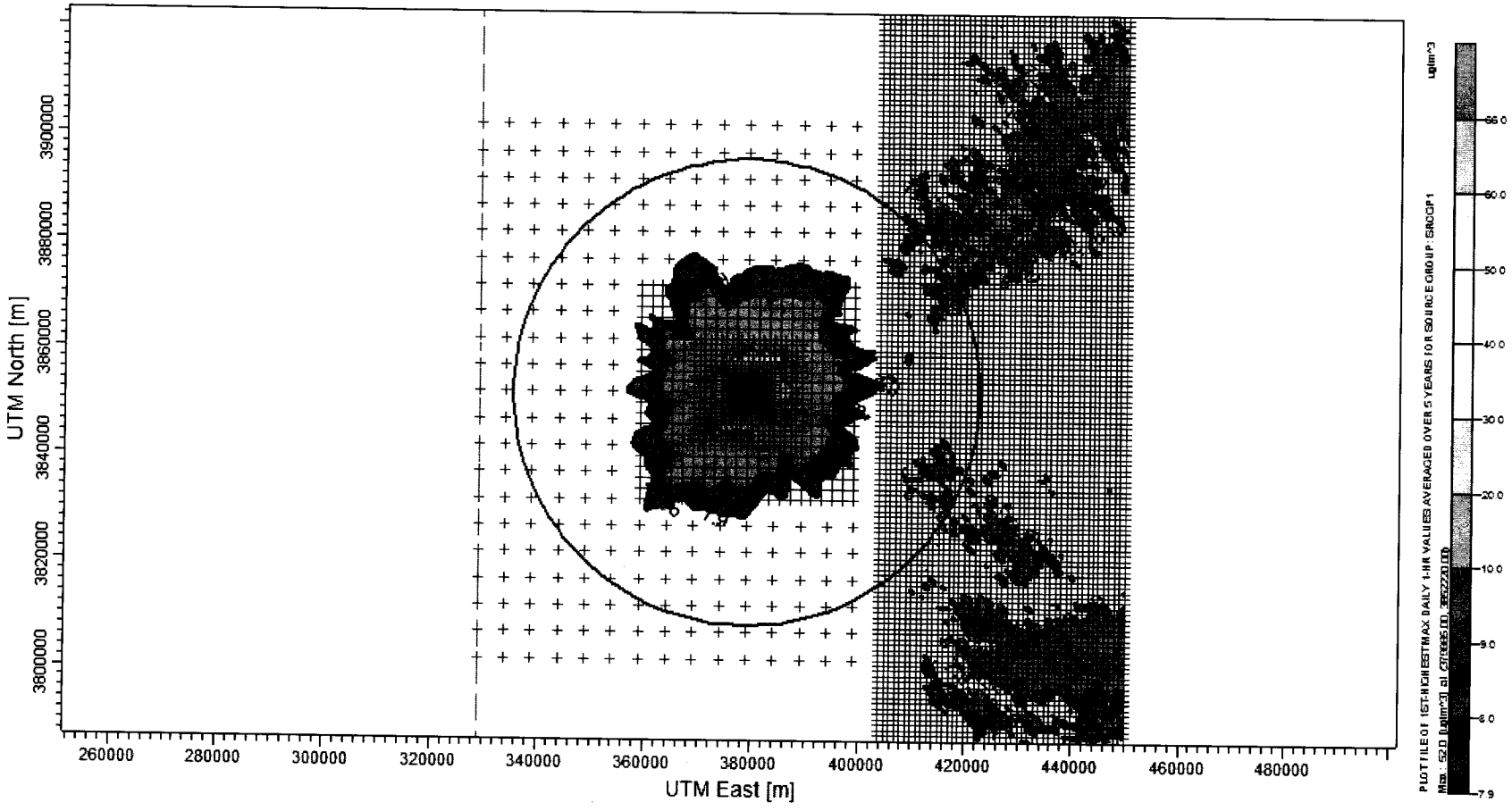


FIGURE 5 - SO2 SIGNIFICANT IMPACT AREA

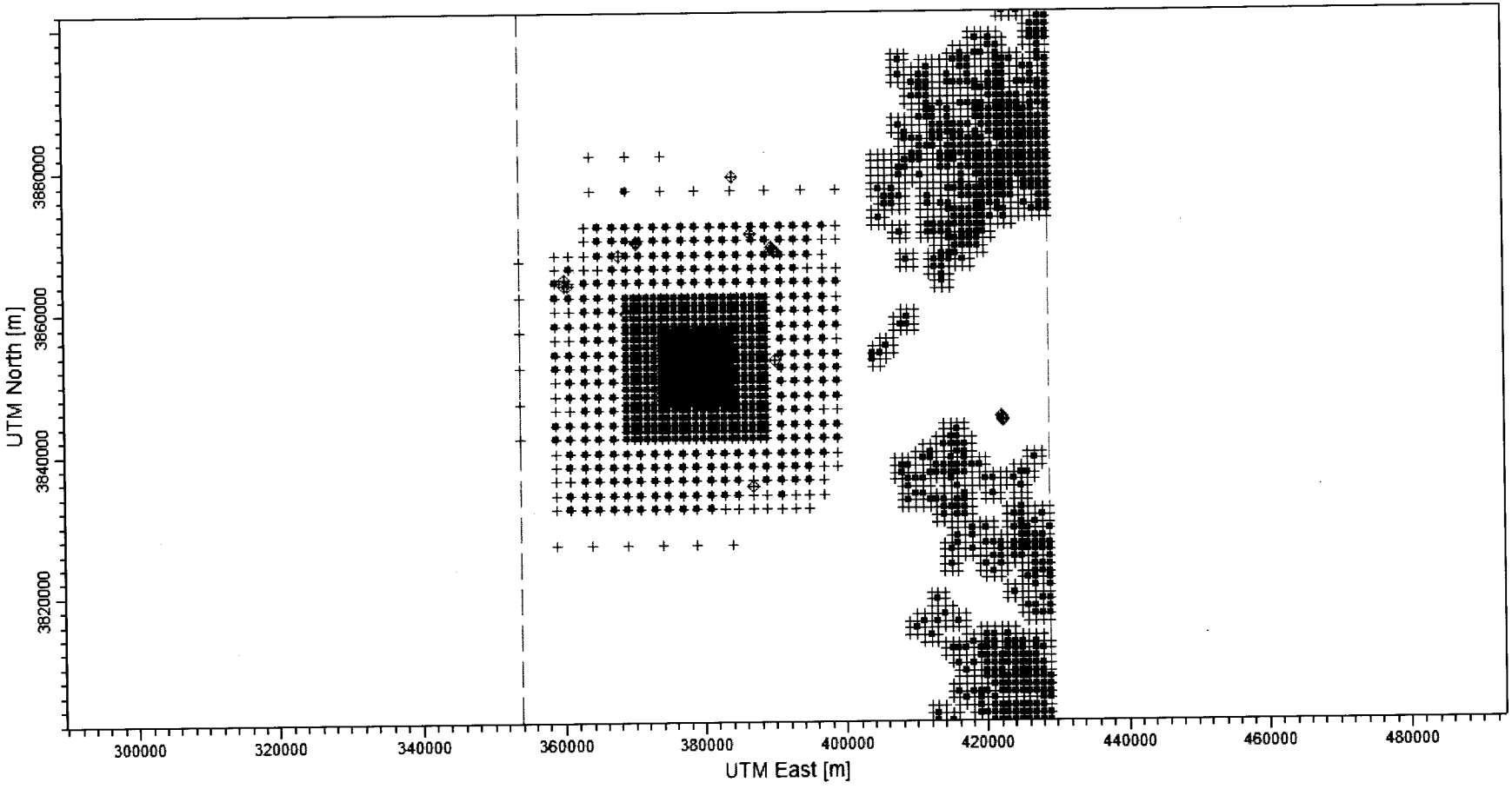


FIGURE 6 - SO_2 CUMULATIVE IMPACT RECEPTOR NETWORK AROUND SIGNIFICANT RECEPTORS

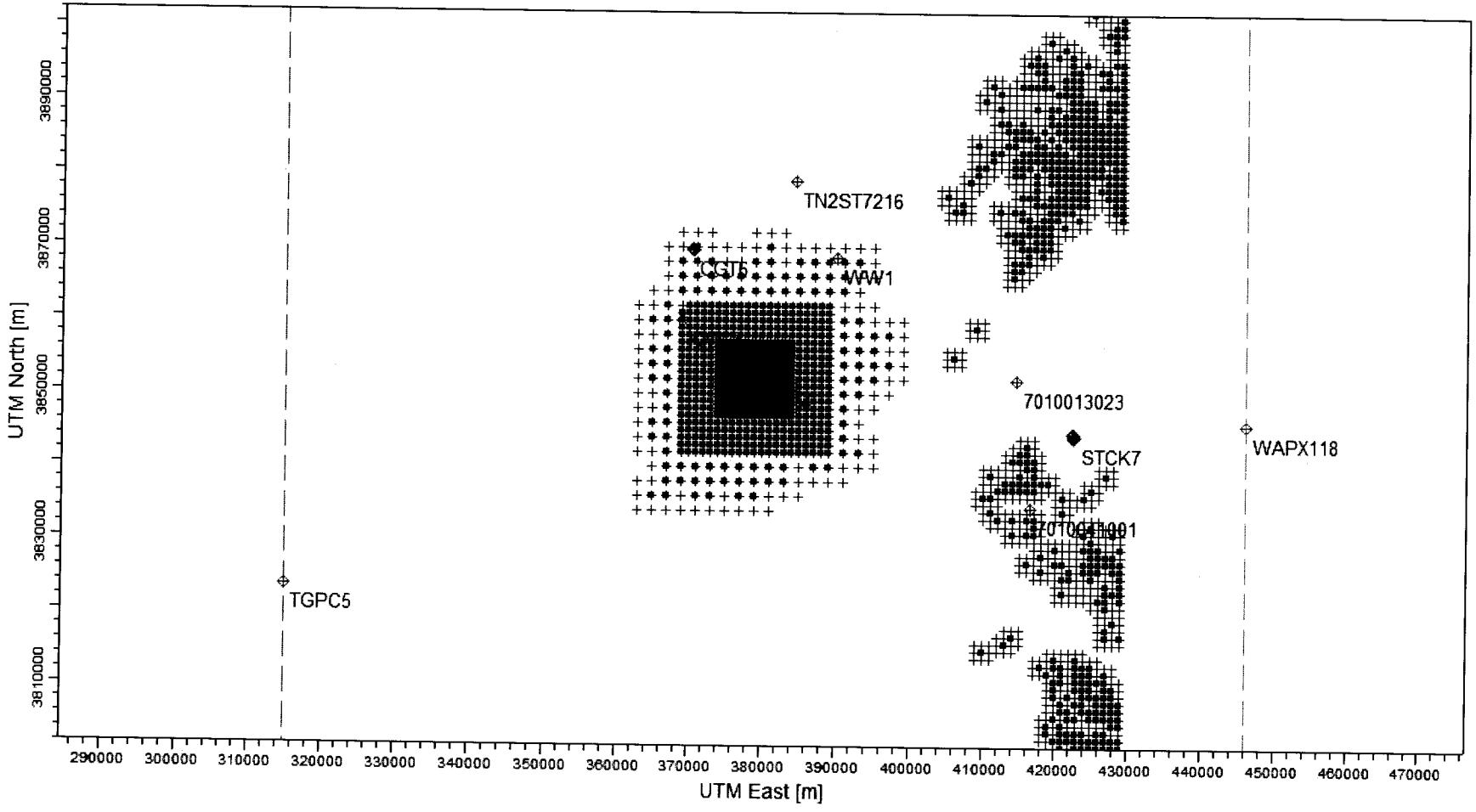


FIGURE 7 - NO_2 CUMULATIVE IMPACT RECEPTOR NEWORK

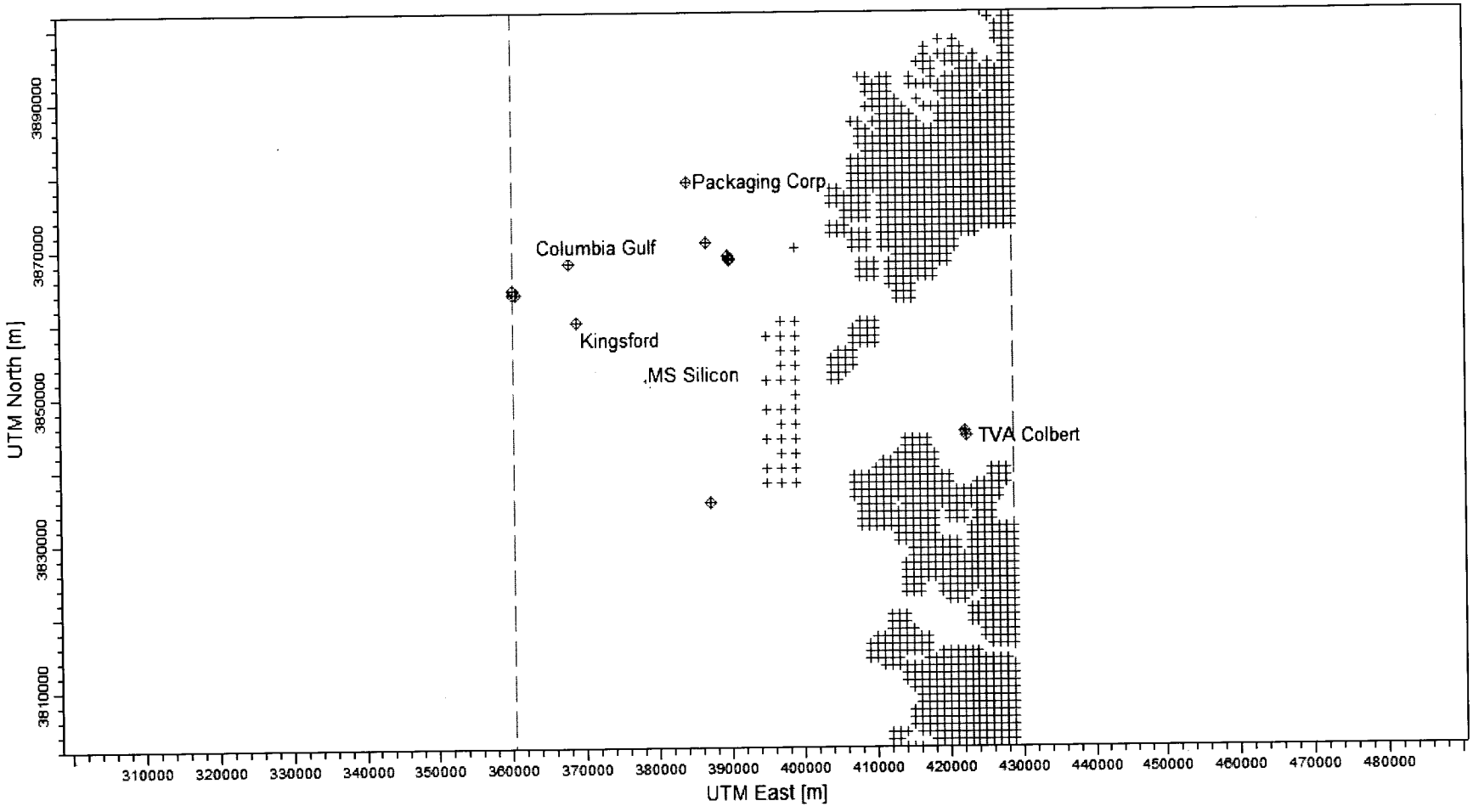


FIGURE 8 - SO_2 CULPABILITY COARSE GRID

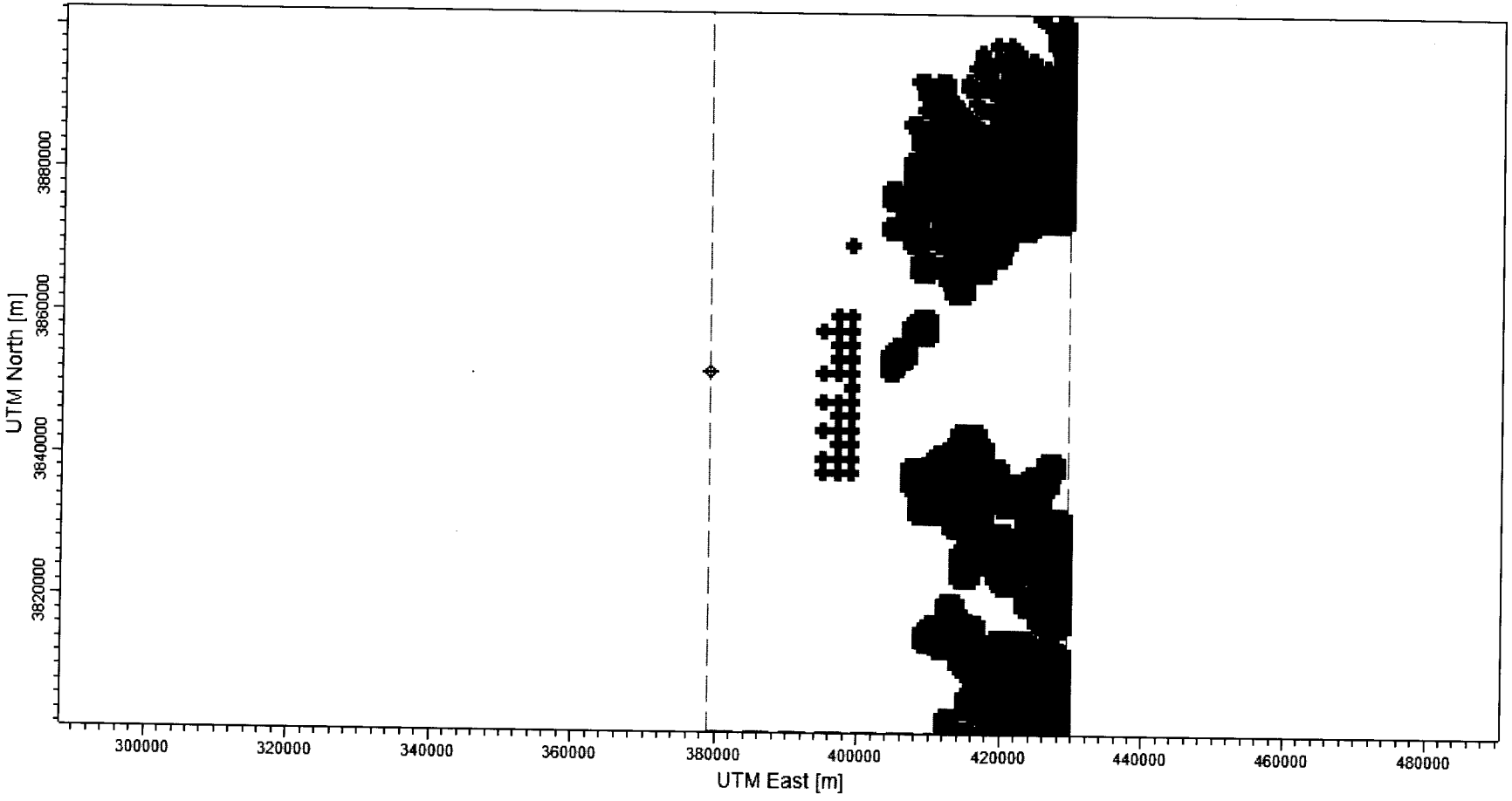


FIGURE 9 - SO2 CULPABILITY FINE RECEPTOR GRID

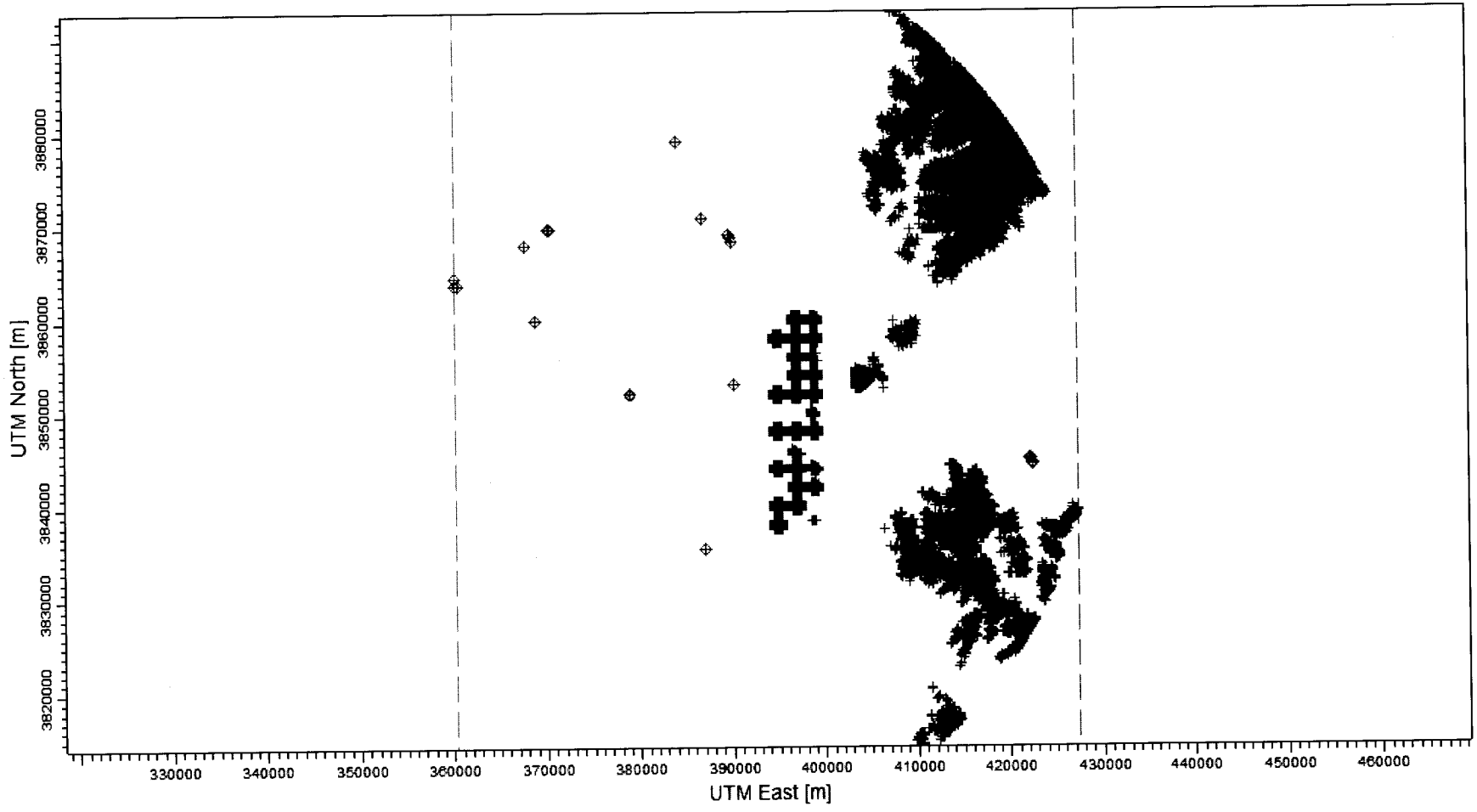


FIGURE 10 - SO2 CULPABILITY FINE GRID WITHIN 50 KM AND MS SILICON SIA

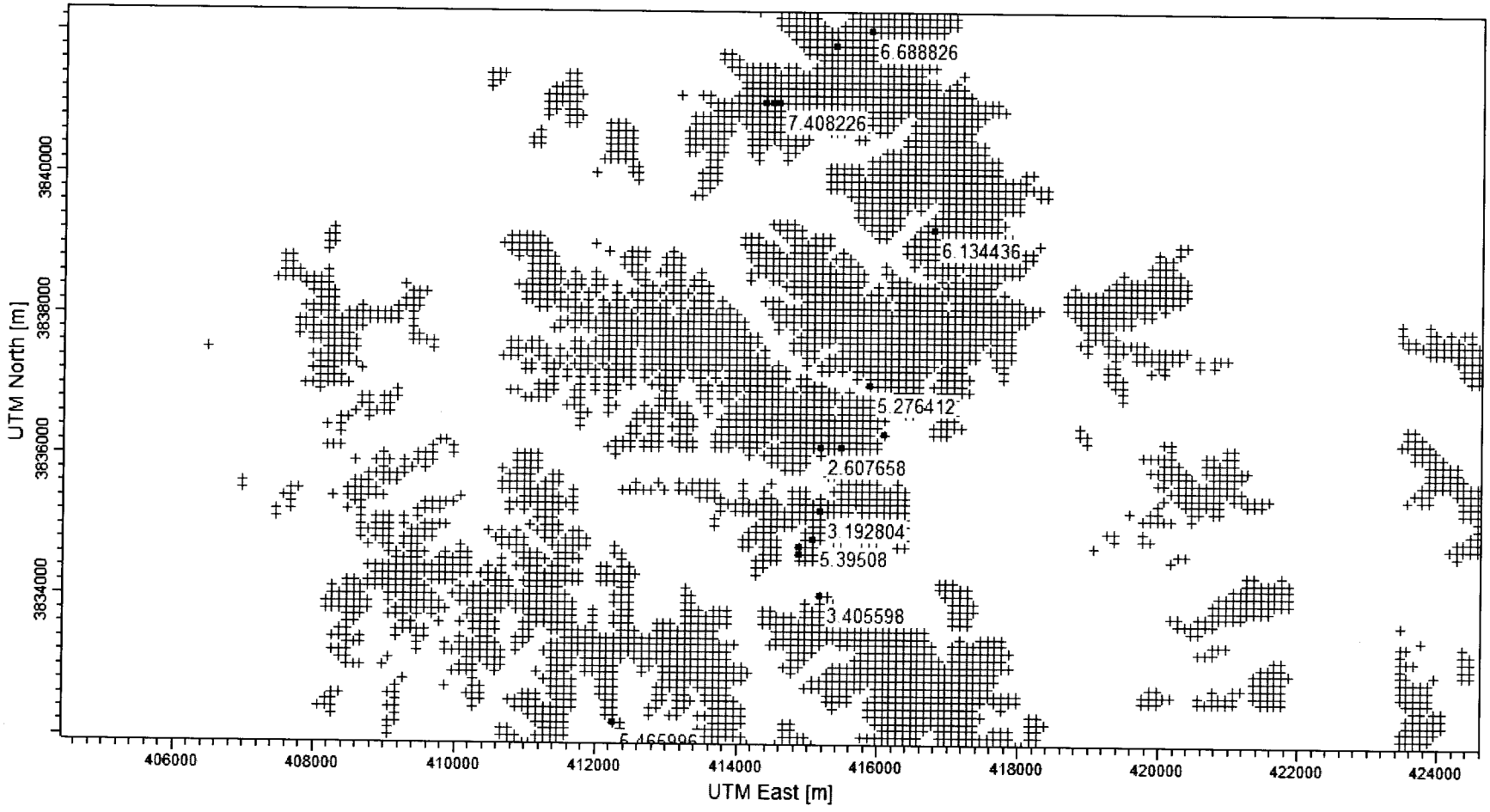


FIGURE 11 - MS SILICON CONTRIBUTION TO SO2 EXCEEDANCE GREATER THAN 1 UG/M3

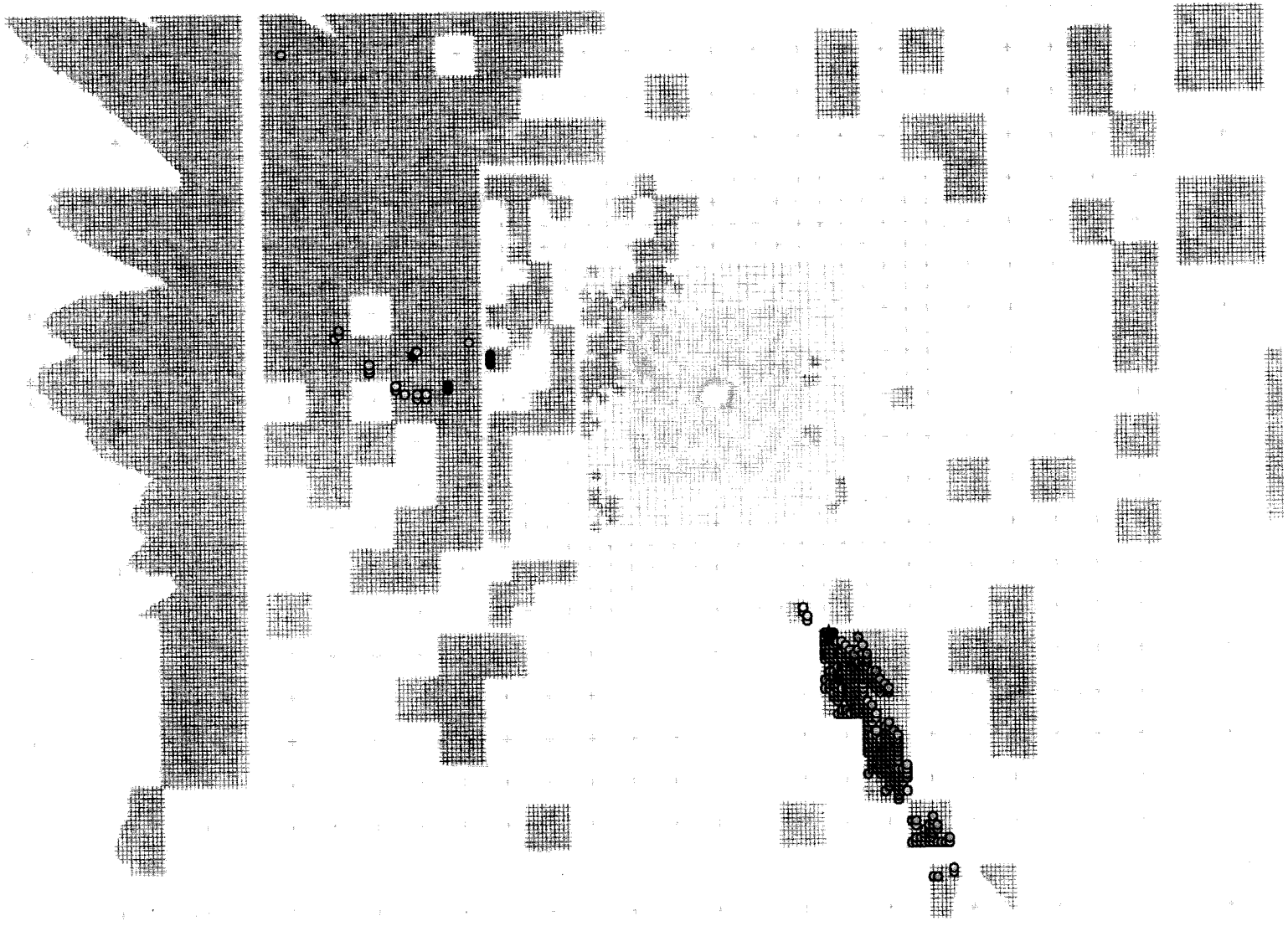


FIGURE 12- MS SILICON CONTRIBUTION TO NO2 EXCEEDANCE GREATER THAN 1 UG/M3

FIGURE 13 - LOCATION OF MAXIMUM MS SILICON CONTRIBUTION TO AN EXCEEDANCE (RED STAR), MS SILICON CONTRIBUTION > 1 UG/M3 (CIRCLES), MODELED EXCEEDANCE (GREY SQUARES)

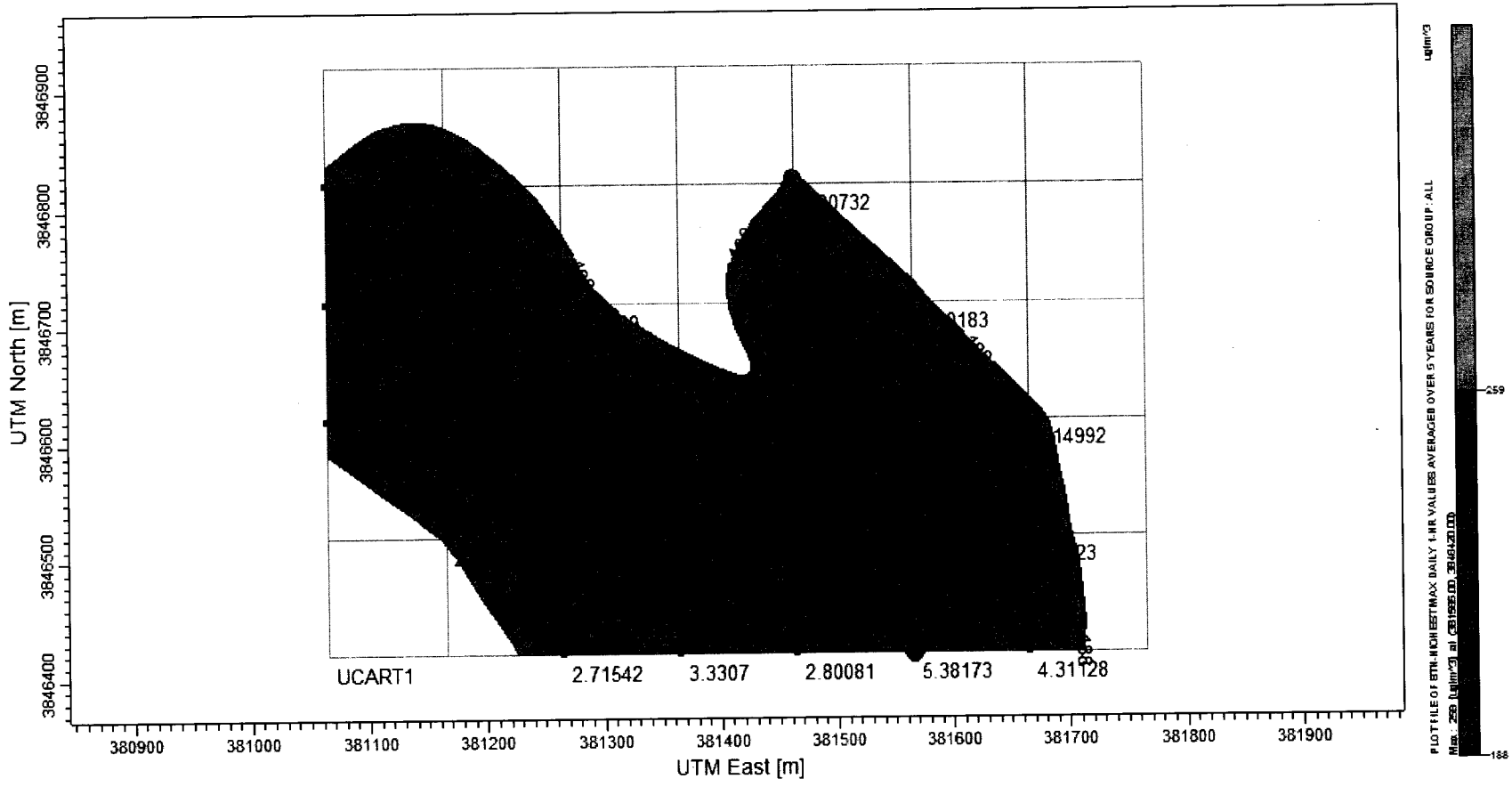


FIGURE 14 - MS SILICON MAXIMUM CONTRIBUTION TO A MODELED EXCEEDANCE.

ATTACHEMENT 1 – BASIS FOR TVA EMISSION INCLUDED IN THE MODELING

The NO_2 and SO_2 "1-hour" standards are based on the 98th percentile of the maximum daily 1-hour emissions averaged over 3-years. In modeling, this is approximated using a 5-year meteorological dataset and averaging across 5-years. TVA Colbert is under a consent decree and will be shutting down Unit No. 5 by December 31, 2015, and Units 1-4 will be shut down by June 30, 2016. Unit 5 could only be operated, at most, for one year simultaneous with MS Silicon and Unit 1-4 could only be operated for 1 ½ years simultaneous with MS Silicon. This represents 1/3 of the standard averaging period for Unit 5 and 1 ½ of the standard averaging period for Units 1-4. To simulate this through modeling, Unit 5 was included in the first 2 years of modeled meteorology and Unit 1-4 was included in the first 1 ½ years of modeled meteorology.

The EPA had expressed concerns that each year of meteorology may not contain worst case conditions and results may be skewed depending on which years of data were used for TVA operating or not operating. In order to alleviate these concerns the 5-years of meteorological data were looked at in terms of wind speed class and wind direction. The frequency of occurrence for wind speed class and direction is shown on the following page. The top most shaded area represents times when the wind is blowing from TVA towards MS Silicon for a wind direction within 45 degrees of a direct azimuth from TVA to MS Silicon. The bottom shaded area represents a wind direction from MS Silicon to TVA. Wind Rose are presented for each year on the page following the table.

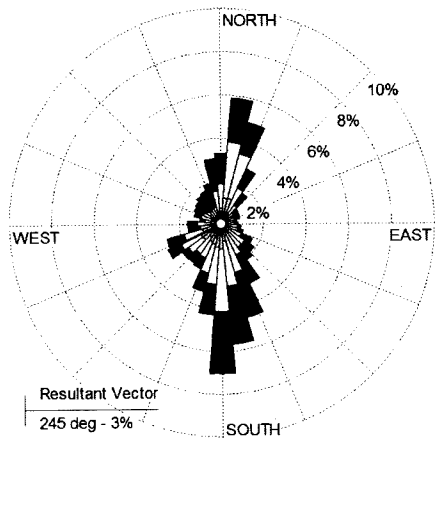
The frequency of occurrence in the two wind directions was evaluated to determine if there would be any bias in the selected years in which TVA would be considered to be operating. If the frequency of occurrence for all years was 4 or below or the frequency of occurrence for all years was above 4 then the years were considered to interchangeable. If some years were at 4 or below while other years were above, a bias was considered. The wind direction and stability class where it was considered that bias may be introduced are highlighted.

For the wind directions from TVA to MS Silicon, the year 2008 appeared to have a bias in the 5.7-8.8 m/s wind class. As TVA was considered to be operating all units for this year of meteorology, this occurrence of wind speeds and direction and the impacts associated were accounted for in the modeling. For the year 2009 and the 8.8-11.1 m/s wind speed class there was one occurrence that was not present in any other year. This occurrence occurred in the first half of 2009 and while all of TVA units were not included at this time it did include Units 1-4. This is only one occurrence and it is not expected to impact the predicted design value.

There is one wind speed class and direction identified in the year 2010 that doesn't appear to be represented in the other years. This is during a time when TVA was not considered to be operating Units 1-5. Overall, the wind speed classes and wind directions appear to be represented in each year, although stability class was not considered.

TVA is the major source of SO_2 for the competing sources and the cause of modeled exceedances. Although the level of modeled exceedance might change in considering which years of meteorology to include the TVA sources operating, changing the years is highly unlikely to result in moving the location of modeled exceedances beyond the MS Silicon facility to a location where MS Silicon could contribute.

	Wind Classes (m/s)→	2007						2008						2009						2010						2011					
	Directions↓	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10
1	355 - 5	67	102	95	30	2	0	101	139	84	36	0	0	36	58	63	29	0	0	35	77	88	21	0	0	31	45	96	16	1	0
2	5-15	110	234	136	45	2	0	97	143	106	43	1	0	49	71	81	37	3	0	52	96	129	33	0	0	40	68	116	34	0	0
3	15 - 25	112	191	99	36	0	0	77	117	96	43	1	0	71	109	66	40	2	0	64	116	104	53	0	0	68	67	119	71	1	1
4	25 - 35	53	113	77	12	0	0	77	119	98	33	0	1	114	209	108	45	3	0	112	196	122	42	0	0	146	166	111	58	2	0
5	35 - 45	52	46	46	14	0	0	120	98	63	26	5	1	164	140	102	54	2	0	144	167	100	36	0	0	166	139	99	32	0	0
6	45 - 55	26	42	18	5	0	0	68	53	54	16	0	0	85	89	68	29	1	0	74	107	84	21	0	0	68	75	69	18	2	0
7	55 - 65	15	41	28	3	0	0	30	42	32	5	0	0	55	69	44	20	0	0	45	61	70	13	0	0	38	57	40	6	0	0
8	65 - 75	23	39	23	0	0	0	28	32	16	2	0	0	40	46	30	12	0	0	30	34	31	7	0	0	35	52	29	1	0	0
9	75 - 85	19	37	12	1	0	0	32	45	18	1	0	0	40	56	23	2	0	0	24	30	10	2	0	0	25	37	13	0	0	0
10	85 - 95	26	35	13	1	0	0	22	28	13	5	0	0	35	51	21	1	0	0	16	28	14	2	0	0	24	30	11	0	0	0
11	95 - 105	17	55	15	0	0	0	28	48	16	11	0	0	43	42	19	0	0	0	24	27	9	1	0	0	29	29	13	0	0	0
12	105 - 115	26	51	22	1	0	0	33	38	20	12	0	0	36	49	31	1	0	0	22	20	5	2	0	0	26	33	12	0	0	0
13	115 - 125	38	59	50	1	0	0	22	46	42	11	0	0	33	20	17	3	0	0	22	24	3	1	0	0	33	42	16	1	0	0
14	125 - 135	43	80	44	3	0	0	19	48	45	9	0	0	34	36	13	2	0	0	17	32	10	0	0	0	24	45	18	1	0	0
15	135 - 145	39	84	54	11	0	0	33	70	65	6	0	0	28	59	22	4	1	0	30	37	13	0	0	0	27	50	19	1	0	0
16	145 - 155	39	109	100	28	3	0	35	96	99	37	2	0	31	64	31	12	0	0	36	51	20	6	0	0	41	58	15	5	0	0
17	155 - 165	55	159	154	38	2	1	42	110	134	73	22	0	47	82	50	17	1	2	49	71	39	13	0	0	42	63	25	6	0	0
18	165 - 175	76	189	172	68	0	4	70	156	170	130	19	1	42	102	67	11	3	0	50	87	93	32	1	0	35	87	56	12	0	0
19	175 - 185	107	262	185	70	6	0	62	129	154	102	5	0	67	132	87	28	0	0	63	121	115	36	3	0	58	109	111	25	0	0
20	185 - 195	102	156	88	39	0	0	84	96	92	84	3	0	58	156	143	66	5	0	69	137	125	60	2	1	63	148	152	63	2	0
21	195 - 205	92	124	65	14	0	0	72	100	76	40	4	0	72	211	192	84	8	0	112	225	127	65	4	1	86	223	235	122	6	0
22	205 - 215	86	74	40	9	0	0	74	76	41	16	0	0	102	239	129	51	3	0	101	203	94	49	7	0	118	263	169	77	17	3
23	215 - 225	73	81	41	7	0	0	77	70	41	6	0	0	77	130	81	20	0	0	102	99	42	18	1	0	99	145	97	57	4	0
24	225 - 235	97	75	24	9	0	0	71	69	43	7	0	0	67	96	50	12	0	0	63	70	34	17	0	0	88	78	61	22	1	0
25	235 - 245	99	92	55	5	0	0	71	56	53	13	2	0	69	91	35	9	2	0	60	67	27	4	3	0	63	67	61	12	1	0
26	245 - 255	84	81	56	18	0	0	54	62	38	14	0	0	58	59	36	10	0	0	58	62	21	2	0	0	53	60	50	8	1	0
27	255 - 265	51	39	44	7	3	0	55	55	26	17	0	0	72	59	42	20	1	0	53	60	30	10	0	0	67	62	59	13	0	0
28	265 - 275	46	58	31	8	1	0	63	52	30	14	0	0	56	64	33	27	2	0	70	63	34	9	1	0	59	58	45	11	0	0
29	275 - 285	27	43	19	3	1	0	38	53	55	7	0	0	57	50	23	13	3	0	59	37	19	14	1	0	53	40	30	9	0	0
30	285 - 295	43	48	27	2	0	0	29	71	43	9	0	0	56	63	26	7	3	0	65	52	24	5	0	0	53	57	24	10	0	0
31	295 - 305	29	57	30	11	0	0	28	72	39	7	0	0	47	49	16	2	0	0	54	60	22	4	0	0	54	55	34	4	0	0
32	305 - 315	27	49	44	14	0	0	36	80	42	5	1	0	46	68	21	4	0	0	43	39	22	2	0	0	50	62	29	1	0	0
33	315 - 325	29	36	51	30	0	0	35	55	55	20	1	0	44	65	44	6	0	0	54	48	39	4	0	0	47	79	43	5	0	0
34	325 - 335	31	41	59	23	0	0	44	68	63	29	0	0	34	79	55	8	0	0	48	82	45	9	0	0	43	57	44	1	0	0
35	335 - 345	27	48	70	28	3	0	50	80	64	20	0	0	32	51	46	6	0	0	40	80	58	9	0	0	26	64	61	7	0	0
36	345 - 355	55	85	99	35	2	0	60	82	75	27	0	0	32	52	45	16	0	0	55	75	96	24	0	0	30	47	71	10	0	0



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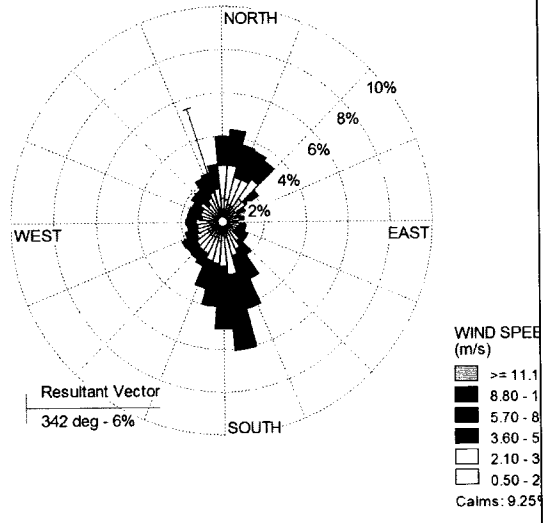

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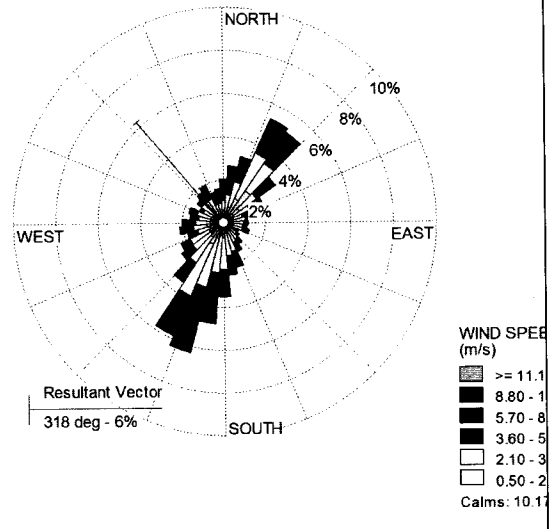

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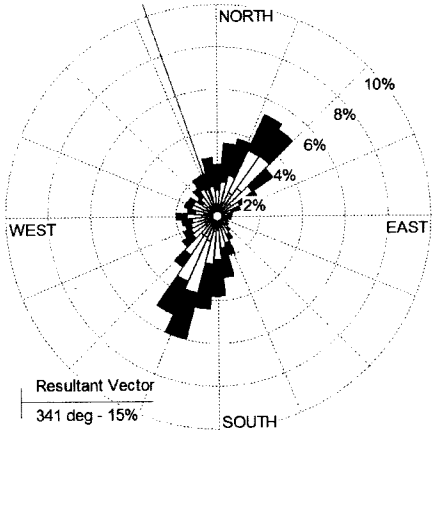

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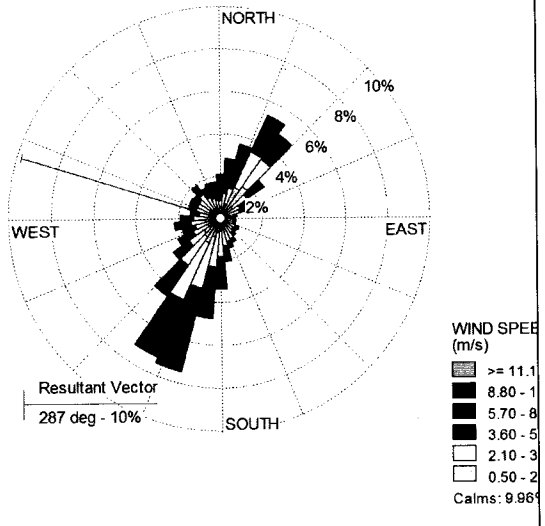


2011

Attachement 2 – 20D Screening for MS Sources

Cnty code	Plant id	name	Utm zone	Utm horz	Utm vert	Distance (km)	NOX (TPY)	>20D (Y/N)	Within SIA (Y/N)	SO2 (TPY)	>20D (Y/N)	Within SIA (Y/N)
093	00009	ACME BRICK COMPANY	16	275.693	3851.71	103.2949383	45.99	N	N	88.04	N	N
081	00135	ADVANCED INNOVATIONS EAST LLC	16	347.502	3816.62	47.37006751	4.47	N	N	0.15	N	N
057	00014	ATLAS MANUFACTURING COMPANY	16	383.47	3787.36	64.81209396	0.09	N	N	0.0004	N	N
081	00132	AUTO PARTS MANUFACTURING MISSISSIPPI INC	16	346.84	3815.18	48.88588376	129.2	N	N	1.2	N	N
141	00052	BAYMONT INC	16	391.108	3816.81	37.23104469	0	N	N	0	N	N
141	00042	BELMONT FIBERGLASS INC	16	389.496	3816.43	37.1040925	1.41	N	N	0.01	N	N
115	00035	BEST FOAM INC	16	331	3803.01	68.58847127	0.32	N	N	0	N	N
057	00022	BIG BEE METAL MANUFACTURING COMPANY INC	16	384.049	3788.67	63.54181076	0.21	N	N	1.95	N	N
139	00046	BILTRITE RIPLEY OPERATIONS LLC	16	323.532	3850.85	55.46758705	25.61	N	N	0.15	N	N
139	00003	BLUE MOUNTAIN PRODUCTION COMPANY, TAYLOR	16	314.455	3835.71	66.55873422	65.7	N	N	249	N	N
081	00013	BONDS PAVING MATERIALS INC	16	347.77	3792.36	67.32313332	46.98	N	N	4.77	N	N
145	00037	BTEC NEW ALBANY LLC	16	322.121	3823.79	63.48488723	246.05	N	N	3.06	N	N
057	00016	C AND W CUSTOM TRAILERS	16	379.6	3804.81	47.20487387	0.15	N	N		N	N
081	00024	CARPENTER COMPANY	16	342.885	3781.78	78.96511193	7.1	N	N	0.06	N	N
003	00003	CATERPILLAR INC	16	360.248	3864.49	22.51436868	62.99	N	N	2.67	N	Y
117	00048	CATERPILLAR REMANUFACTURED COMPONENTS GR	16	359.9	3838.33	23.48228278	9.68	N	N	0.12	N	N
003	00028	COLUMBIA GULF TRANSMISSION, CORINTH COMP	16	370.24	3869.24	19.32521738	5304.7	Y	N	1.97	N	Y
141	00051	COMPOSITE BUILDING SYSTEMS INC	16	383.995	3835.51	17.24971895	0.16	N	N	0	N	Y
081	00071	CONFORTAIRE INC	16	344.558	3788.44	72.29469314	0.24	N	N	0	N	N
081	00008	COOPER TIRE COMPANY, THE	16	342.444	3789.03	72.81497893	221.79	N	N	188.52	N	N
115	00048	CUSHIONS TO GO	16	314.12	3794.7	86.56156739	1.03	N	N	0.01	N	N
115	00008	EATON CUSTOM SEATING LLC	16	314.79	3791.05	88.53338336	1.614	N	N	0.0106	N	N
141	00033	ERGON ASPHALT AND EMULSIONS INC, YELLOW	16	386.876	3870.87	20.44338045	9.4	N	N	33.4	N	Y
141	00056	ERSHIGS INC. ERSHIGS IUKA FRP FACILITY	16	389.72	3869.08	20.16285523	3.6	N	N	0.3	N	Y
139	00063	FIVE STAR MARINE INC	16	324.185	3849.15	54.87733283	0.03	N	N	0	N	N
081	00046	FLEXIBLE FOAM PRODUCTS INC	16	344.8	3789.15	71.56050963	6.02	N	N	0.04	N	N
081	00099	FMC TECHNOLOGIES INC	16	343.561	3802.29	61.0483946	14.9	N	N	0.09	N	N
081	00072	FOAM CRAFT	16	337.908	3791.67	73.00104771	2.35	N	N	0.01	N	N
081	00022	FXI INC	16	342.607	3781.97	78.92482735	7.71	N	N	0.05	N	N

Cnty code	Plant id	name	Utm zone	Utm horz	Utm vert	Distance (km)	NOX (TPY)	>20D (Y/N)	Within SIA (Y/N)	SO2 (TPY)	>20D (Y/N)	Within SIA (Y/N)
117	00004	GENERAL BINDING CORPORATION	16	357.173	3838.13	25.85690542	24	N	N	0.16	N	N
139	00005	HANKINS INC	16	330.838	3843.04	48.97770429	93.3	N	N	91.6	N	N
057	00021	HICKORY HILL FURNITURE CORPORATION	16	369.394	3791.08	61.67954359	0.91	N	N	0.01	N	N
081	00102	HICKORY SPRINGS MANUFACTURING COMPANY, V	16	342.698	3781.29	79.48641788	10.21	N	N	0.07	N	N
057	00007	HOMAN INDUSTRIES	16	370.723	3789.12	63.42862072	61.6	N	N	3.14	N	N
081	00025	HOME DECOR INNOVATIONS, A DIV OF RENIN	16	344.132	3788.97	72.03338666	0.54	N	N	0	N	N
081	00037	HUNTER DOUGLAS INC, TUPELO CENTER	16	343.112	3781.53	79.08519333	13.85	N	N	0.08	N	N
115	00051	IDEAL FOAM LLC, PONTOTOC FACILITY	16	314.804	3793.08	87.13489835	5.74	N	N	0.05	N	N
139	00065	IDEAL FOAM LLC, RIPLEY FACILITY	16	324.8	3849.35	54.25279297		N	N		N	N
081	00088	INDEPENDENT FURNITURE SUPPLY COMPANY	16	337.571	3794.38	70.96690307	2.06	N	N	0.01	N	N
141	00011	INTERNATIONAL CONVERTER	16	390.163	3853.08	11.22680714	15.32	N	N	0.12	N	Y
003	00030	KIMBERLY CLARK CORPORATION, CORINTH MILL	16	367.862	3867.98	19.46496156	60.13	N	N	1.72	N	Y
003	00051	KINGSFORD MANUFACTURING COMPANY	16	368.94	3859.96	12.80862916	328.48	Y	Y	75.17	N	Y
071	00009	LEHMAN ROBERTS COMPANY, PLANT NUMBER 11	16	269.281	3808.64	117.9684327	10.85	N	N		N	N
117	00051	MARIETTA WOOD SUPPLY INC	16	365.05	3819.71	35.18232314	0.27	N	N		N	N
145	00008	MASTER BILT PRODUCTS	16	317.38	3823.94	67.70042248	2.23	N	N	0.02	N	N
141	00058	METAL EXPORTS LLC	16	390.093	3868.4	19.79485801	13.69	N	Y	95	N	Y
003	00019	MISSISSIPPI POLYMERS INC	16	360.262	3863.78	22.11740501	12.23	N	N	0.18	N	Y
057	00028	MUELLER CASTING COMPANY INC	16	370.103	3790.55	62.10072054	82.43	N	N	28.38	N	N
057	00012	MUELLER COPPER TUBE COMPANY	16	370.231	3790.55	62.08451736	48.19	N	N	11.15	N	N
081	00058	NORBORD INDUSTRIES INC	16	348.311	3814.64	48.35370002	292.82	N	N	50.29	N	N
145	00043	NORTH MISSISSIPPI BIODIESEL INC	16	317.328	3822.59	68.32027394	5.47	N	N	9.7	N	N
081	00026	NORTH MISSISSIPPI MEDICAL CENTER	16	341.924	3790.09	72.16836165	153.42	N	N	234.04	N	N
139	00055	NORTHEAST MISSISSIPPI SOLID WASTE MANAGE	16	323.064	3868.74	58.37180126	22.65	N	N	7.66	N	N
139	00014	OIL DRI PRODUCTION COMPANY	16	322.367	3847.18	56.82646927	283.64	N	N	278.5	N	N
071	00029	OLIN CORPORATION	16	268.314	3809.87	118.4264168	45.67	N	N	3.16	N	N
115	00002	PASLODE	16	314.428	3793.43	87.17933654	1.6	N	N	0.01	N	N
081	00118	PREGIS INNOVATIVE PACKAGING	16	344.794	3788.81	71.86135837	8.81	N	N	0.05	N	N
115	00024	PREMIERE PLASTICS INC	16	317.842	3791.42	86.08363891	2.15	N	N	0.01	N	N

Cnty code	Plant id	name	Utm zone	Utm horz	Utm vert	Distance (km)	NOX (TPY)	>20D (Y/N)	Within SIA (Y/N)	SO2 (TPY)	>20D (Y/N)	Within SIA (Y/N)
139	00020	PROFILE PRODUCTS LLC	16	316.4	3840.05	63.71996833	47.76	N	N	137.79	N	N
139	00001	ROGERS GROUP INC, RIPLEY ASPHALT	16	325.558	3845.08	53.87690716	99	N	N	99	N	N
093	00030	ROURA IRON WORKS, INC	16	276.82	3847.86	102.251828	0.58	N	N	0.004	N	N
093	00052	ROXUL USA INC	16	261.224	3873.26	119.6650479	403.13	N	N	1035.39	N	N
081	00027	SUNSHINE MILLS INC	16	341.641	3786.95	75.01874362	22.59	N	N	0.14	N	N
081	00049	TEGRANT DIVERSIFIED BRANDS INC	16	341.197	3787.94	74.38377402	15.41	N	N	55.2	N	N
145	00019	TENNESSEE GAS PIPELINE COMPANY, NEW ALBA	16	314.949	3823.5	70.09972878	1903.68	Y	N	0.32	N	N
115	00042	THREE RIVERS SOLID WASTE MANAGEMENT AUTH	16	310.478	3795.51	88.8038811	64.33	N	N	30.36	N	N
141	00053	TIFFIN MOTORHOMES INC, PAINT FACILITY	16	389.317	3816.43	37.05091332	351.39	N	N	2.71	N	N
003	00052	TIMBER PRODUCTS COMPANY	16	360.643	3863.78	21.79307822	7.02	N	N	0.13	N	Y
141	00002	TISHOMINGO ACQUISITION LLC, DBA TBEI	16	387.099	3835.34	18.53776307	3.3	N	N	0.02	N	N
057	00031	TOPLINE MANUFACTURING COMPANY INC	16	384.039	3787.84	64.36941866	0.03	N	N		N	N
057	00034	TOYOTA BOSHOKU AMERICA	16	359.649	3792.98	62.11877977	99	N	N	0.01	N	N
145	00045	TOYOTA MOTOR MANUFACTURING MISSISSIPPI I	16	325.754	3805.38	70.76764683	448	N	N	5.5	N	N
009	00019	TVA MAGNOLIA COMBINED CYCLE	16	299.078	3855.86	80.00195613	1009.19	N	N	71.14	N	N
071	00021	UNIVERSITY OF MISSISSIPPI, THE	16	266.857	3804.72	121.6938557	249	N	N	249	N	N
093	00001	VALERO MKS LOGISTICS LLC, COLLIERVILLE T	16	258.668	3873.51	122.2253508	94.92	N	N	22.59	N	N
145	00048	VUTEQ, MARTINTOWN SITE	16	311.04	3818.15	75.91676748	1.56	N	N	0.03	N	N
141	00044	WATER WAY INC	16	389.944	3868.74	19.99601877	1.45	N	Y	0.01	N	Y
141	00057	WATER WAY INC, PAUL EDMONDSON ROAD FACIL	16	389.655	3853.15	10.72825169	0.08	N	N	0	N	N
141	00041	YELLOW CREEK COATING SERVICES	16	386.85	3870.84	20.40475222		N	N		N	N

SIGNIFICANT IMPACT ANALYSIS

NO2_SIA_Grid2 – NO2 significant impact directory (Application receptor grid augmented with 1km spacing in complex terrain areas)

NO2_SIA_Grid2.ADI – AERMOD Input File

NO2_SIA_Grid2.ADO – AERMOD Output File

NO2_SIA_Grid2.AD – Plot File Directory

01H1G001.PLT – 5-yr Avg of 1st High Impact for Source Group 1

01H1G002.PLT – 5-yr Avg of 1st High Impact for Source Group 2

01H1G003.PLT – 5-yr Avg of 1st High Impact for Source Group 3

01H1G004.PLT – 5-yr Avg of 1st High Impact for Source Group 4

01H8G001.PLT – 5-yr Avg of 8th High Impact for Source Group 1

01H8G002.PLT – 5-yr Avg of 8th High Impact for Source Group 2

01H8G003.PLT – 5-yr Avg of 8th High Impact for Source Group 3

01H8G004.PLT – 5-yr Avg of 8th High Impact for Source Group 4

AN00G001.PLT – 5-yr Avg of Annual Impact for Source Group 1

AN00G002.PLT – 5-yr Avg of Annual Impact for Source Group 2

AN00G003.PLT – 5-yr Avg of Annual Impact for Source Group 3

AN00G004.PLT – 5-yr Avg of Annual Impact for Source Group 4

SO2_SIA_Grid2 – SO2 significant impact directory (Application receptor grid augmented with 1km spacing in complex terrain areas)

SO2_SIA_Grid2.ADI – AERMOD Input File

SO2_SIA_Grid2.ADO – AERMOD Output File

SO2_SIA_Grid2.AD – Plot File Directory

01H1G001.PLT – 5-yr Avg of 1st High Impact for Source Group 1

01H1G002.PLT – 5-yr Avg of 1st High Impact for Source Group 2

01H1G003.PLT – 5-yr Avg of 1st High Impact for Source Group 3

01H1G004.PLT – 5-yr Avg of 1st High Impact for Source Group 4

01H4G001.PLT – 5-yr Avg of 4th High Impact for Source Group 1

01H4G002.PLT – 5-yr Avg of 4th High Impact for Source Group 2

01H4G003.PLT – 5-yr Avg of 4th High Impact for Source Group 3

01H4G004.PLT – 5-yr Avg of 4th High Impact for Source Group 4

AN00G001.PLT – 5-yr Avg of Annual Impact for Source Group 1

AN00G002.PLT – 5-yr Avg of Annual Impact for Source Group 2

AN00G003.PLT – 5-yr Avg of Annual Impact for Source Group 3

AN00G004.PLT – 5-yr Avg of Annual Impact for Source Group 4

NO2_SIA_FineGrid – Directory for NO2 Significance Analysis on NO2 Cumulative Refined Receptor Network. This receptor network contained only those receptors with an exceedance of the standard from initial cumulative analysis run plus added extended 100-meter grid around the receptor. The significance analysis was rerun after adding additional 100-m spaced receptors.

NO2_SIA_FineGrid.ADI – AERMOD Input File

NO2_SIA_FineGrid.ADO – AERMOD Output File

NO2_SIA_FineGrid.AD – Plot File Directory

01H1GALL.PLT - 5-yr Avg of 1st High Impact

01H8GALL.PLT - 5-yr Avg of 8th High Impact

AN00GALL.PLT - 5-yr Avg of Annual Impact

SO2_SIA_FineGrid – Directory for SO2 Significance Analysis on SO2 Cumulative Refined Receptor Network. This receptor network contained only those receptors with an exceedance of the standard from initial cumulative analysis run plus added extended 100-meter grid around the receptor. The significance analysis was rerun after adding additional 100-m spaced receptors.

SO2_SIA_FineGrid.ADI – AERMOD Input File

SO2_SIA_FineGrid.ADO – AERMOD Output File

SO2_SIA_FineGrid.AD – Plot File Directory

01H1G001.PLT – 5-yr Avg of 1st High Impact for Source Group 1

01H1G002.PLT – 5-yr Avg of 1st High Impact for Source Group 2

01H1G003.PLT – 5-yr Avg of 1st High Impact for Source Group 3

01H1G004.PLT – 5-yr Avg of 1st High Impact for Source Group 4

01H4G001.PLT – 5-yr Avg of 4th High Impact for Source Group 1

01H4G002.PLT – 5-yr Avg of 4th High Impact for Source Group 2

01H4G003.PLT – 5-yr Avg of 4th High Impact for Source Group 3

01H4G004.PLT – 5-yr Avg of 4th High Impact for Source Group 4

AN00G001.PLT – 5-yr Avg of Annual Impact for Source Group 1

AN00G002.PLT – 5-yr Avg of Annual Impact for Source Group 2

AN00G003.PLT – 5-yr Avg of Annual Impact for Source Group 3

AN00G004.PLT – 5-yr Avg of Annual Impact for Source Group 4

CUMULATIVE IMPACT ANALYSIS

\CIA\NO2_Culpability – Directory contains the full impact analysis

\CIA\NO2_Culpability\NO2_20XX – individual year runs with initial receptor grid

NO2_20XX.ADI – AERMOD Input file

NO2_20XX.ADO – AERMOD Output file

NO2_Process.accdb – Access database used to merge individual years into a 5-yr average

Query1 – Determines receptors with a 5-yr average H8H above NAAQS

Query2 – Determines 5-year average for each modeled exceedance of the NAAQS and each source groups contribution to the exceedance.

Query3 – Determines each source groups maximum contribution to an exceedance by receptor

NO2_20XX.AD – Plot file and MAXDCONT file directory

01H8G001.PLT – Plot file for cumulative design value

20XXExceedance.dat – MAXDCONT file

\CIA\NO2_Culpability\Refined – Directory contains the full impact analysis with receptors at 100-m spacing surrounding the previously identified receptors with exceedances

NO2_Refined.accdb – Access database used to merge individual years into a 5-yr average.

"5yr_avg_Exceedance Table" – Contains the merged 5yr values

Form1 - contains button with the code used to average the individual years into a 5yr average.

"FineMaxImpacts" Query – Contains maximum impacts and contribution to impacts at each receptor.

NO2_20XX.ADI – AERMOD Input file

NO2_20XX.ADO – AERMOD Output file

NO2_20XX.AD – Plot file and MAXDCONT file directory

01H8G001.PLT – Plot file for cumulative design value

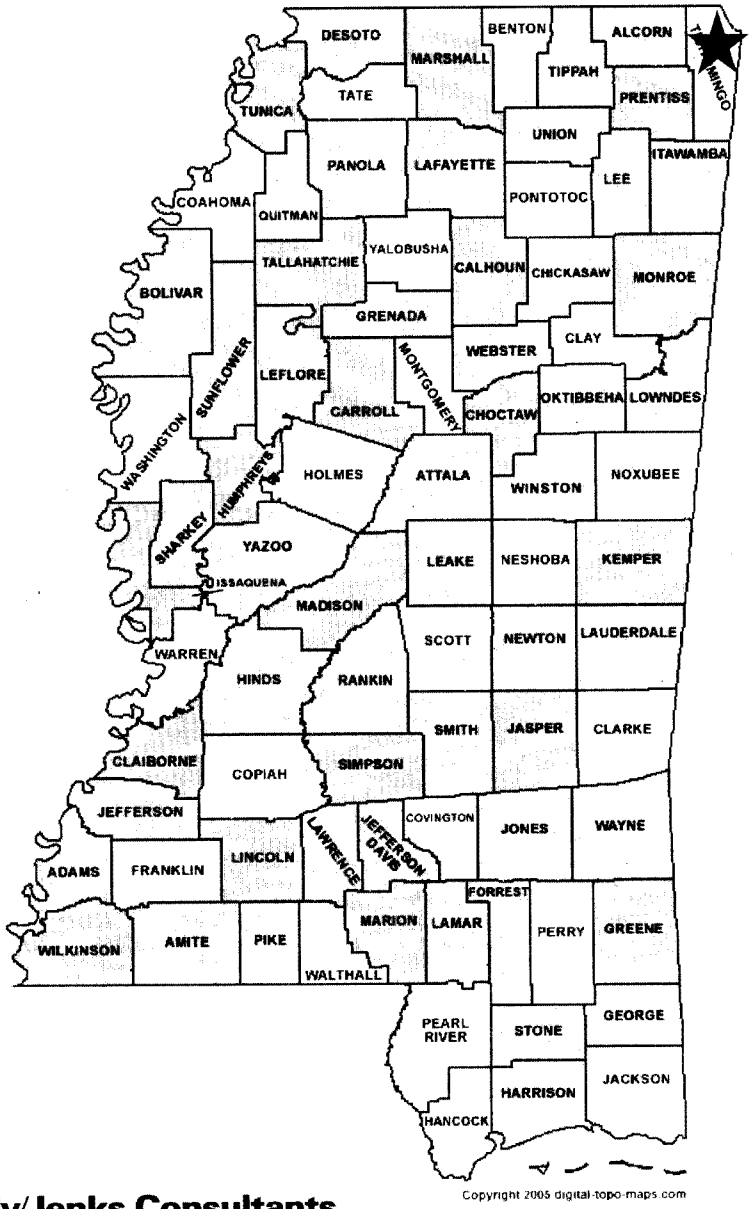
20XXExceedance.dat – MAXDCONT file

\CIA\SO2_20XX – directories for initial runs of SO2 by individual year to determine areas with NAAQS Exceedance

\CIA\SO2_Culpability\SO2_20XX – directories for individual years run with only exceedance receptors from initial runs

\CIA\SO2_Culpability\Refined Grid\20XX – directories for individual years with 100-m spacing added around receptors modeled greater than NAAQS for 5-yr average

Refined Exceedance.accdb – Access database used to average individual years to 5-yr average

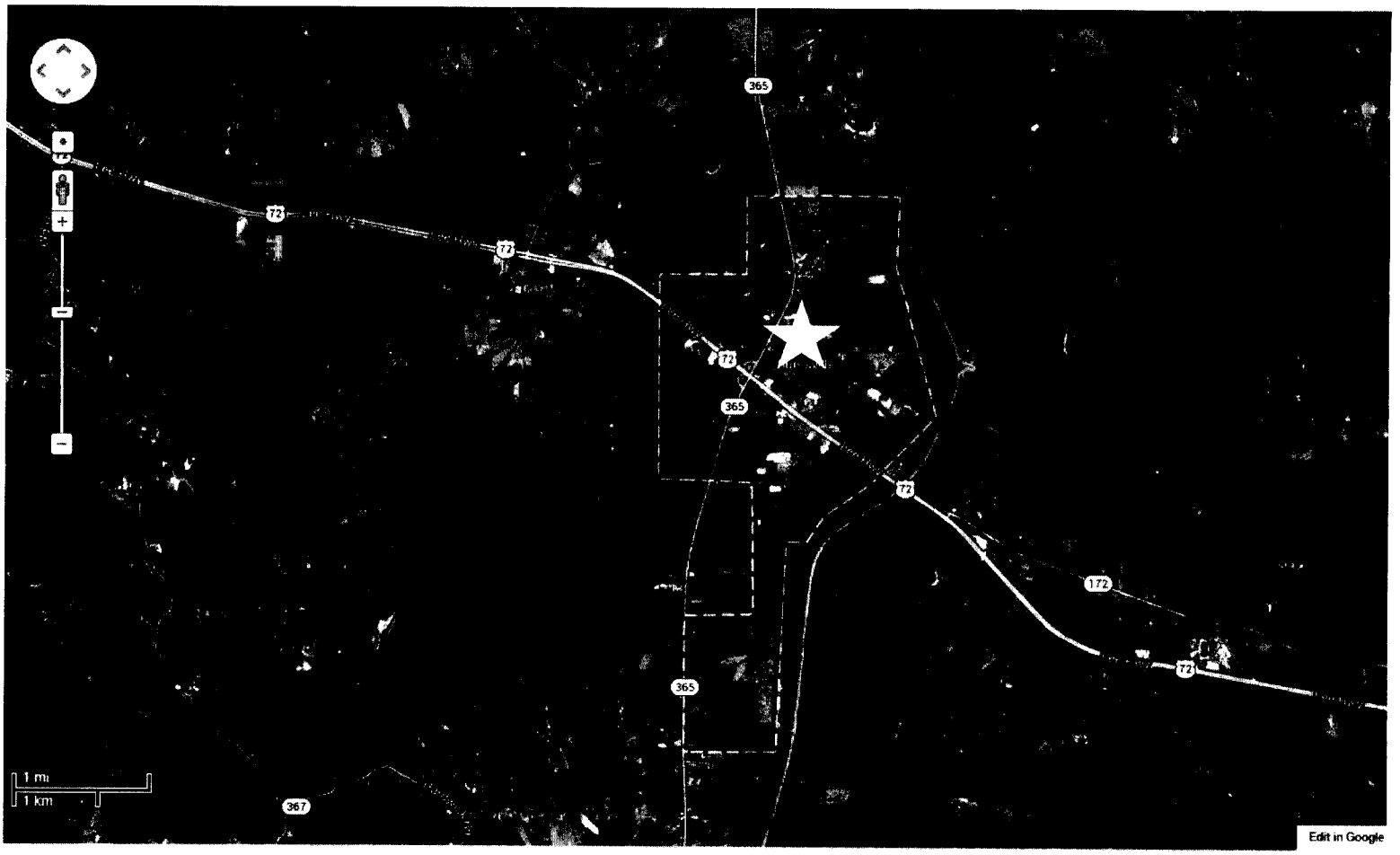


★ Location of Proposed Pla

Figure 1-1. Map of Mississippi Counti
Proposed Plant

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

Kennedy/Jenks Consultants
Engineers & Scientists



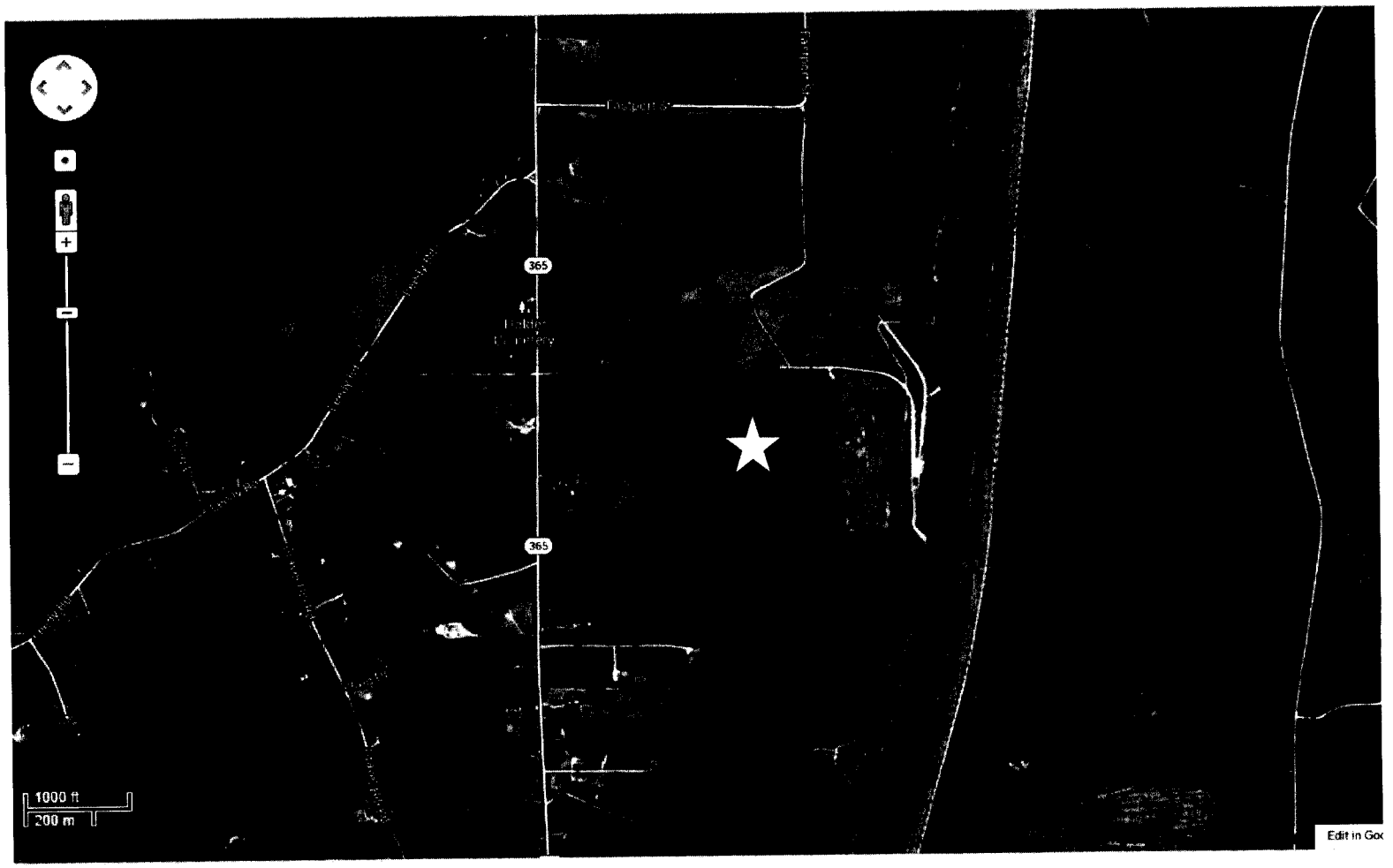
Location of Burnsville, MS

★ Location of Proposed Plant

Figure 1-2. Location of Proposed Silic
Relation to Burnsville, MS

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

Kennedy/Jenks Consultants
Engineers & Scientists

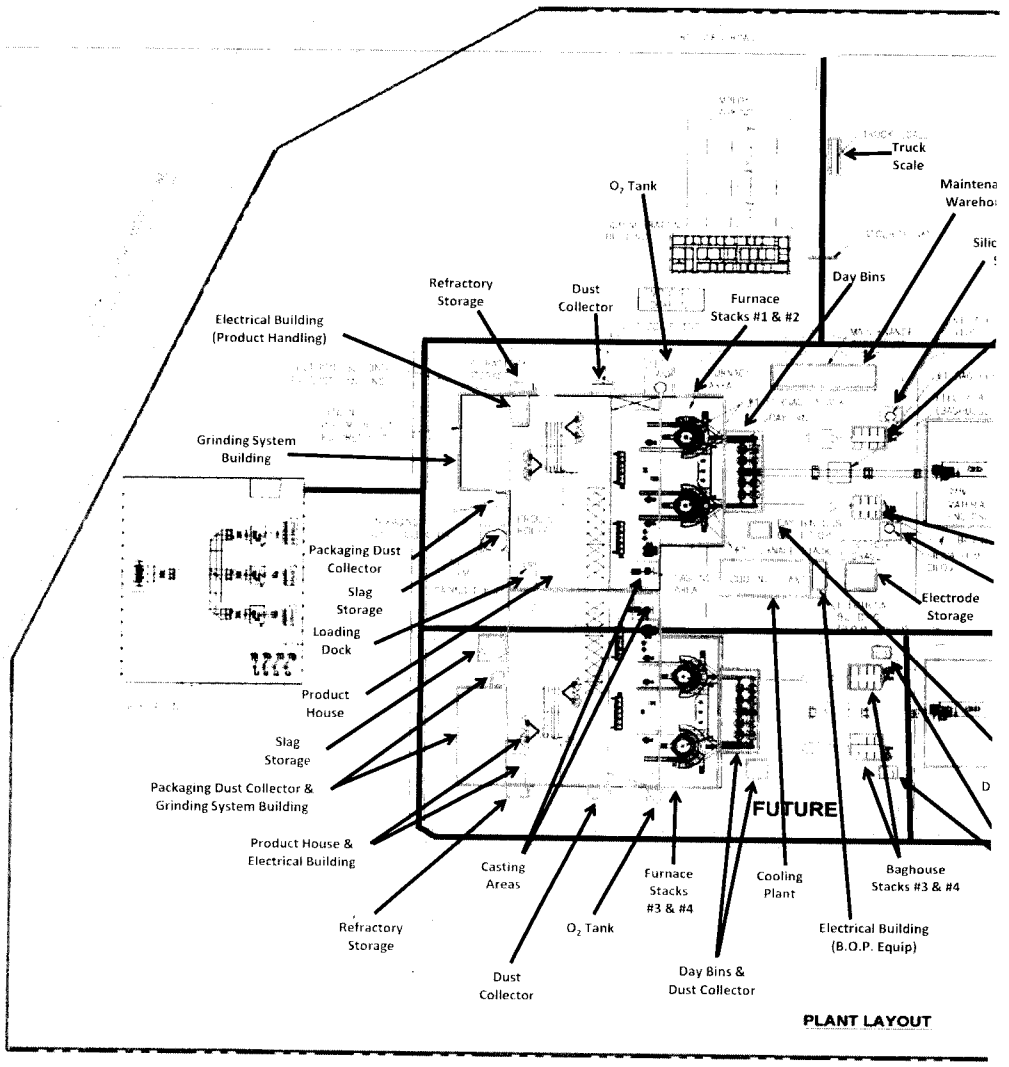


Location of Proposed Plant

Figure 1-3. Location of Proposed Plar

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

Kennedy/Jenks Consultants
Engineers & Scientists



Plant Propery Boundary - Entire property is assumed to be fenced

Plant Roadway - Assumed that 95% of roadways are paved

Phase I Emission Sources, Control Devices and Equipment

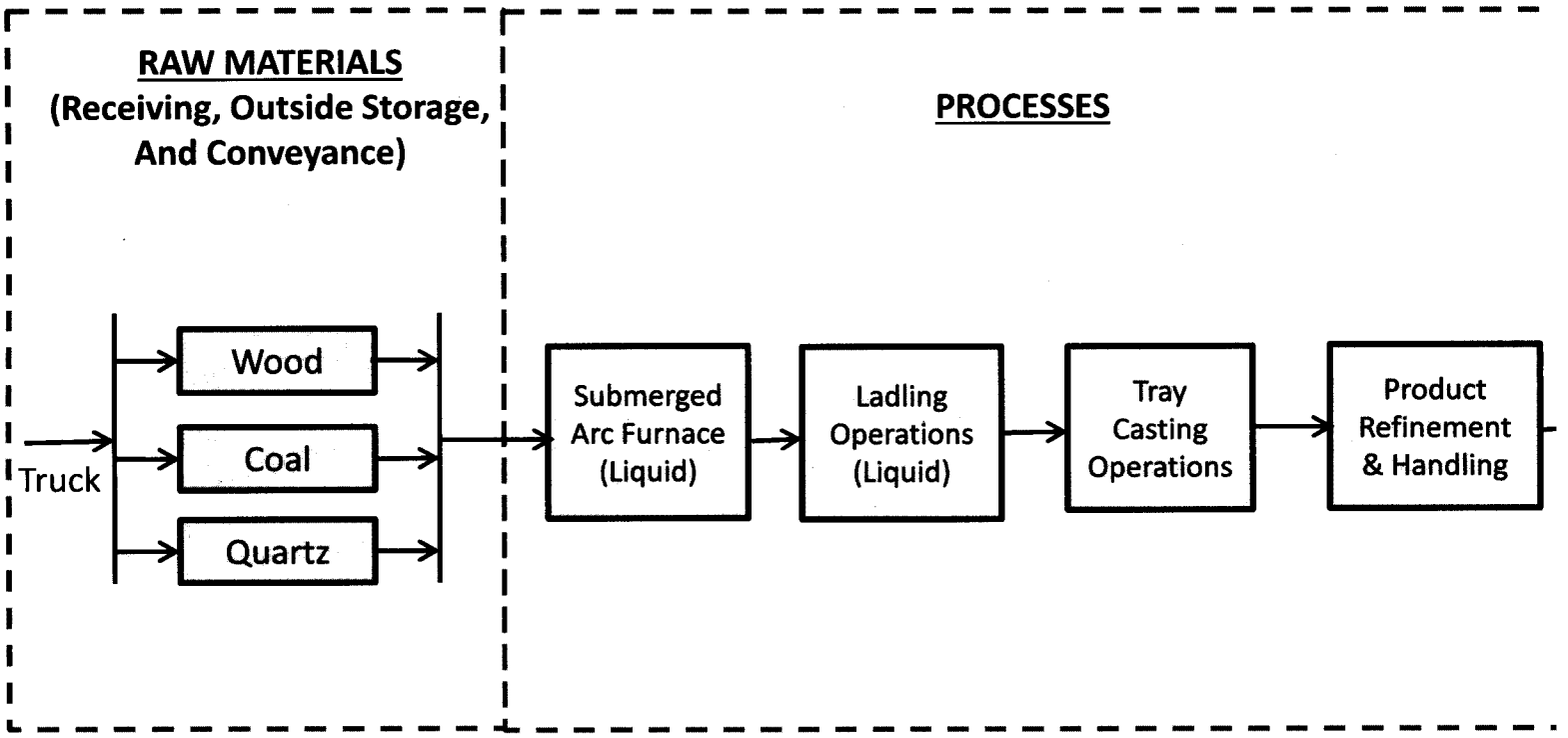
Phase II Emission Sources, Control Devices and Equipment

APPROVALS

CLIENT | CV

REV

SILICON MANUFACUTRING PROCESS



Note: Phase I to include two (2) submerged arc furnaces, ladling operations and tray casting operations. Phase II t include two (2) additional submerged arc furnaces, ladling operations and tray casting operations.

Figure 2-2. General Process Flow Diag Manufacturing Process (AA-000)

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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Basic Silicon Manufacturing Process	Quartz will be blended with a carbon source (i.e., coal and wood) and super submerged arc furnace. As the mix heats, the carbon will react with the oxyger forms CO gas, thereby reducing the quartz to 99% silicon. The CO gas will vent the top of the furnace while the liquid silicon is drained, or tapped, from the b furnace. Although the heating/reduction process will be continuous while the operation, raw materials will be added to the furnace and silicon will be tapp furnace in batches.
Submerged Arc Furnace	The furnace will be filled with charge materials (combination of quartz containi and woodchips). The power will be delivered by carbon electrodes submerged i materials. The electrodes will deliver a three-phase current which heats the ch to ~ 2,000 C°. At this temperature the silicon dioxide will be sublimated to pro gas (SiO) before additional reaction with carbon precipitates the gas to the m Simultaneous to the condensation of the molten silicon, a percentage of the SiO through the unreacted charge and along with the created carbon monoxide wil produce an amorphous silicon dioxide (silica fume) and carbon dioxide. The byproduct will be collected in a baghouse and sold to cement companies as a st to refractory producers.
Tapping Process	The molten metal will be tapped from the furnace through a hole near the bott refined by gas treatment. During the gas treatment, the oxides and carbides w and the resultant material will typically be 99.3% silicon with the balance mainl iron, calcium, aluminum and titanium.
Casting Process	The metal will then be casted into either cast iron molds or silicon metal fines. A has been cooled it will be crushed and sized to customer specifications. Any undersized material will be re-melted during the casting process.

Figure 2-2a. Process Descriptions and

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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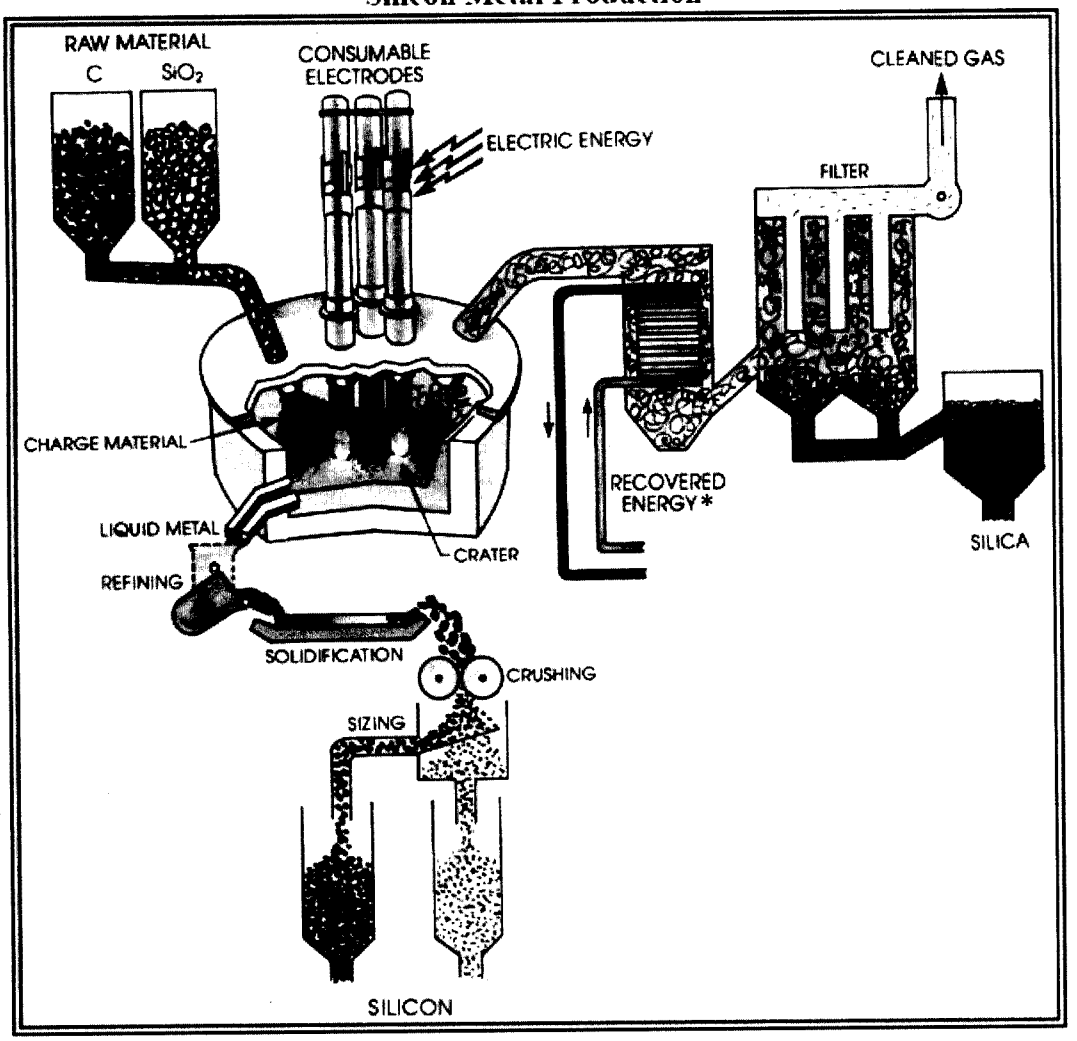
Engineers & Scientists

Silicon Metal Production



Note:
*The recovered energy option considered for the proposed M facility

Figure 2-2b. General Process Flow Di Manufacturing Process (AA-000)

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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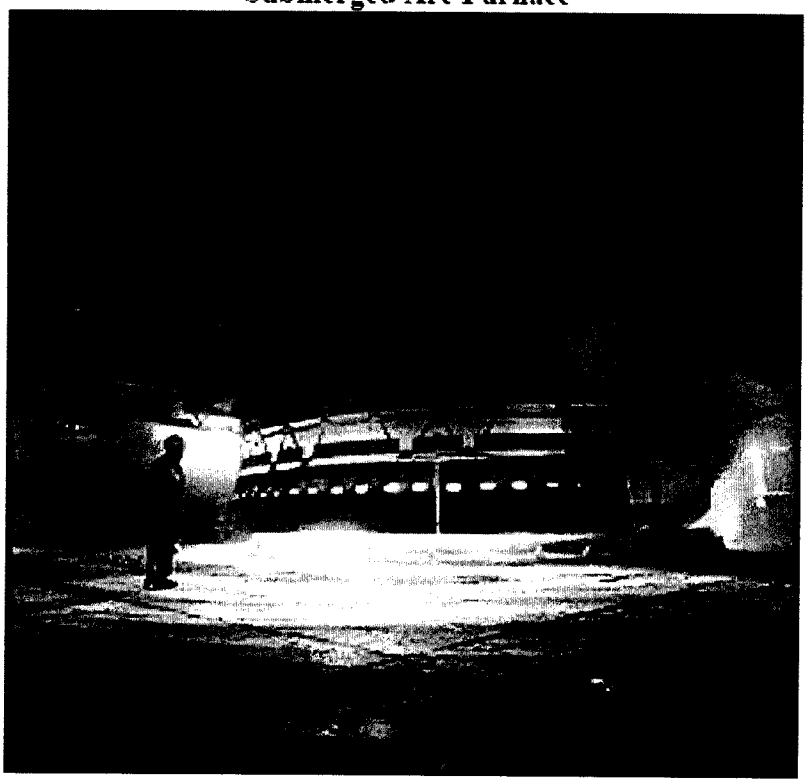
Submerged Arc Furnace



Silicon Metal Tapping

Silicon Metal Casting

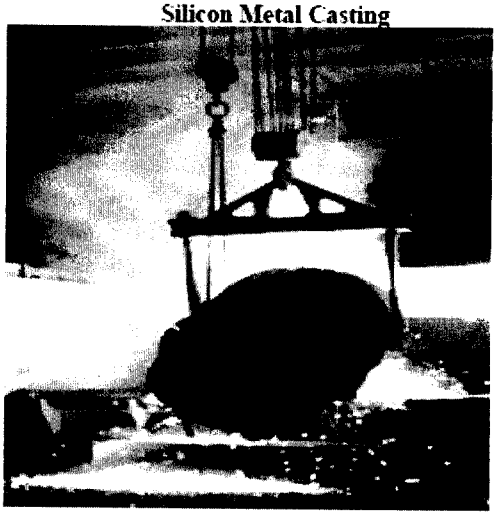


Figure 2-2c. Representative Pictures I
Manufacturing Process (AA-000)

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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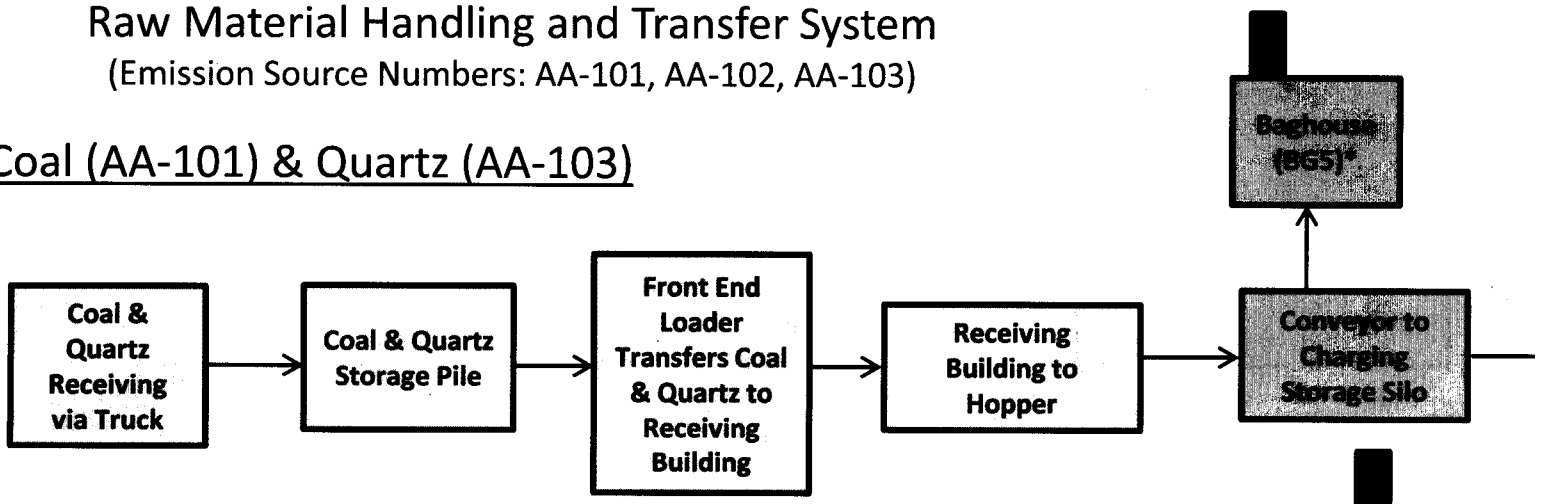
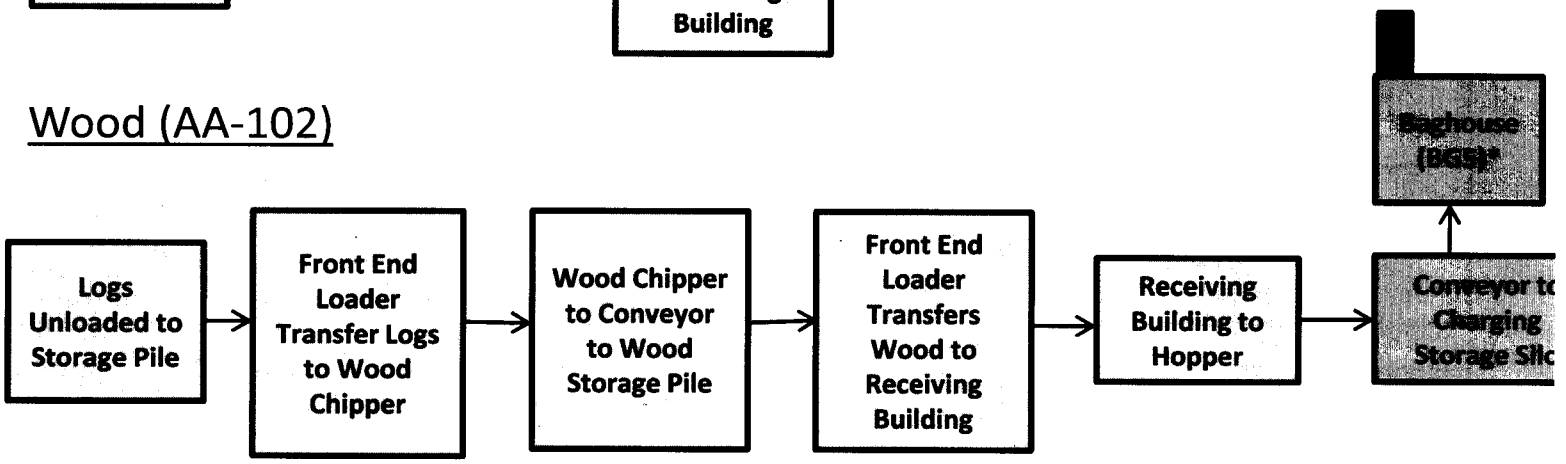
Raw Material Handling and Transfer System

(Emission Source Numbers: AA-101, AA-102, AA-103)

Coal (AA-101) & Quartz (AA-103)



Wood (AA-102)



Notes:

*Total baghouse flow rate is 120,000 acfm. The number of baghouses may vary, however the total flow volume should reflect a points to the baghouse(s) for Phase I and II.

*SAF – Submerged Arc Furnace

*BG5 – Baghouse #5

Exhaust stack(s) with potential to emit regulated air pollutants

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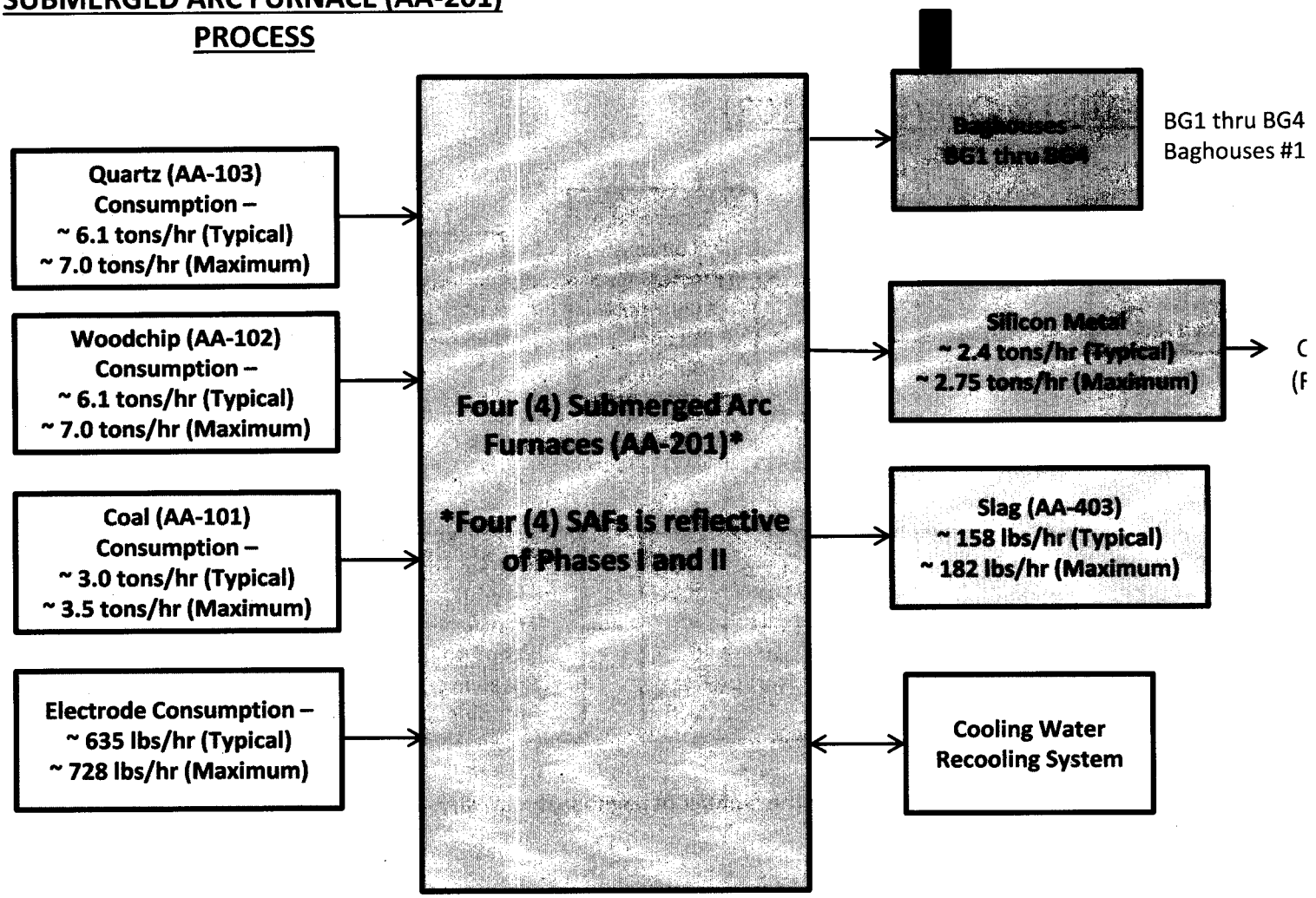
Figure 2-3. General Process Flow Diag Handling and Transfer

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

SUBMERGED ARC FURNACE (AA-201) PROCESS



Exhaust stack(s) with potential to emit regulated air pollutants

Kennedy/Jenks Consultants
Engineers & Scientists

Figure 2-4. General Process Flow Diag
Furnaces

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

LADLE AND TRAY CASTING OPERATIONS
(AA-201a AND AA-202)

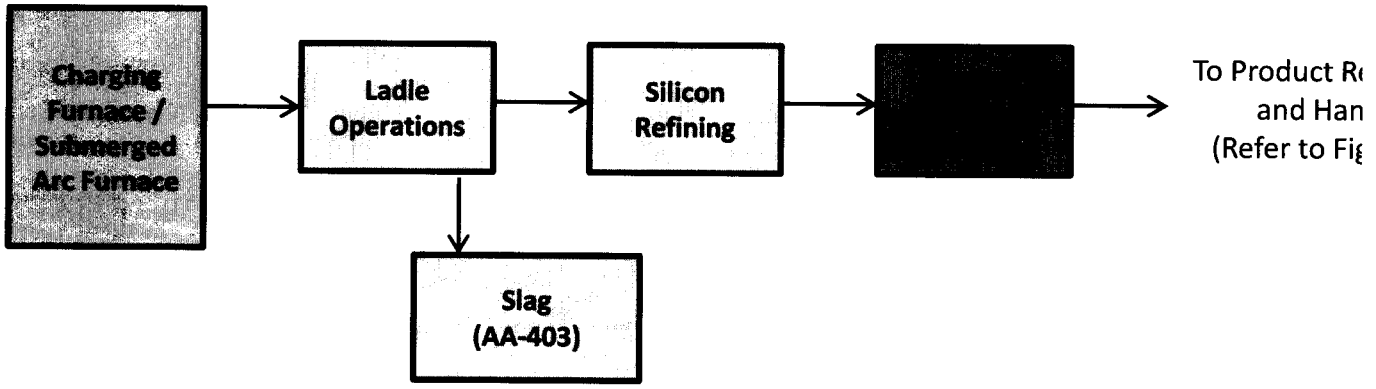


Figure 2-5. General Process Flow Diag
Casting Operations

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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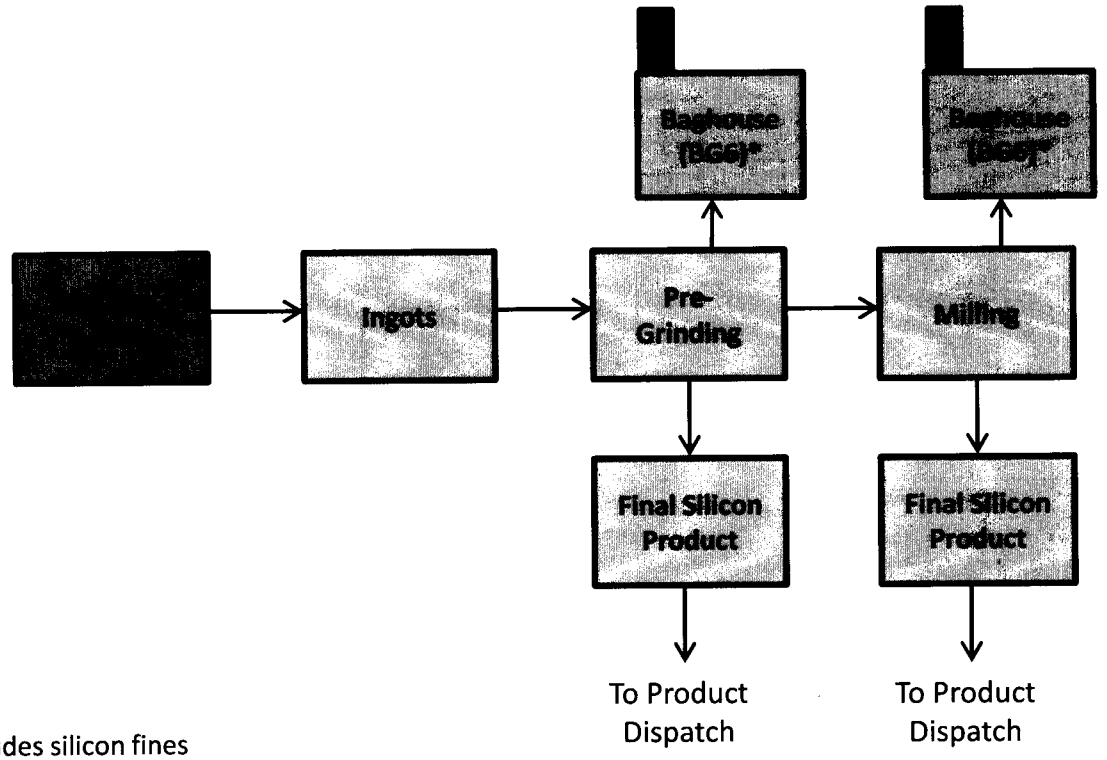
PRODUCT REFINEMENT & HANDLING AREA
(AA-301)



Notes: *Baghouse includes silicon fines

Product refinement and handling will also be used to refine SAF slag material

Exhaust stack(s) with potential to emit regulated air pollutants

Figure 2-6. General Process Flow Diag
Refinement & Handling Area

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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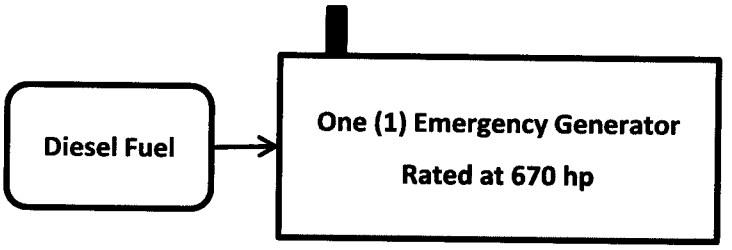
EMERGENCY SUPPORT EQUIPMENT
(AA-501)



Emission sources with potential to emit regulated air pollutants

Figure 2-7. General Process Flow Diag
Equipment

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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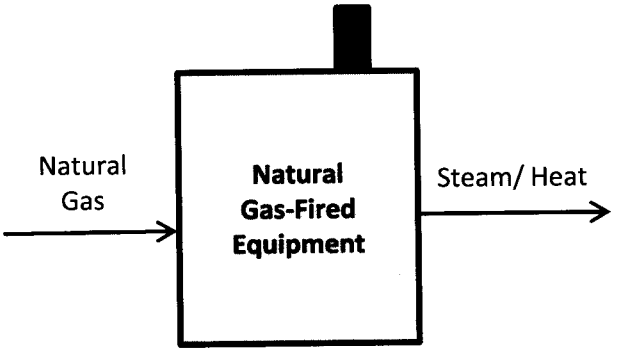
NATURAL GAS COMBUSTION



Ladle Preheaters #1 - #4	AA-202	10.0 MMBtu/hr each

Note: Four (4) ladle preheaters will be used to support Phases I and II

Emission sources with potential to emit regulated air pollutants

Figure 2-8. General Process Flow Diag
Combustion Equipment

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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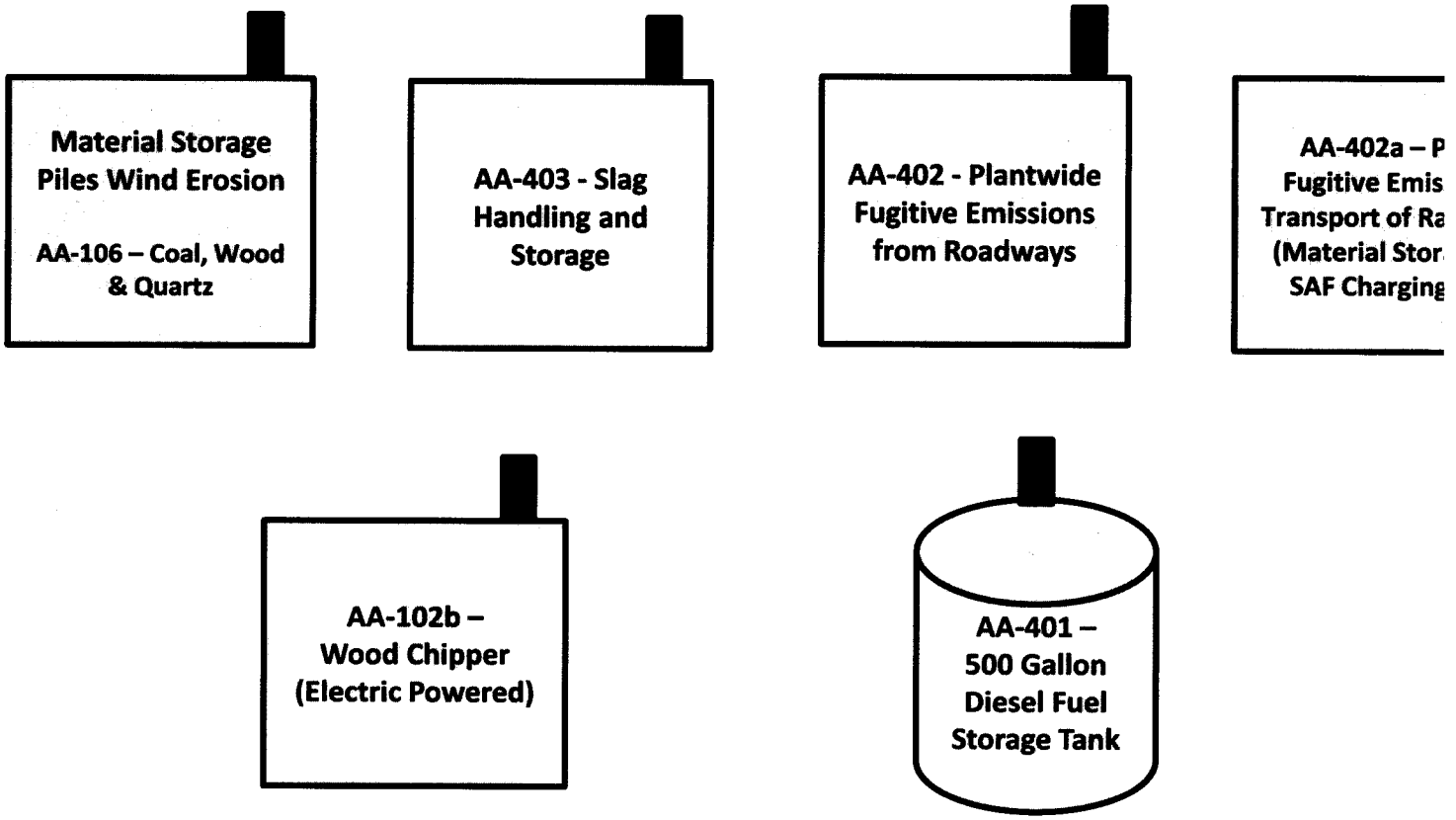
OTHER PLANTWIDE OPERATIONS AND ACTIVITIES



Emission Sources with potential to emit regulated air pollutants

Figure 2-9. General Process Flow Diag
Operations and Activities

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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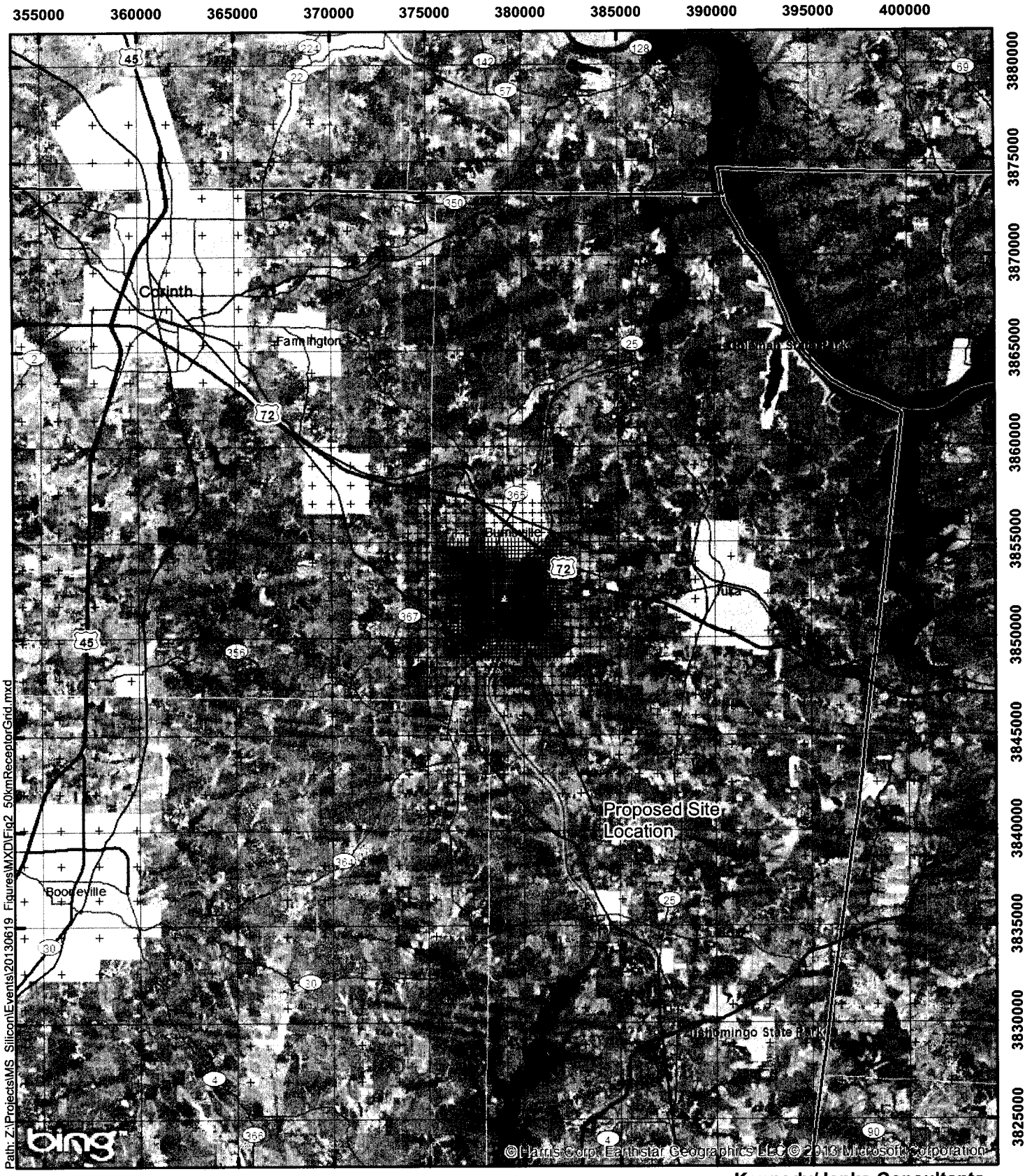


Legend

- Risk Receptors
- City Areas
- State Boundaries
- County Boundaries
- Interstate
- State Highway
- County Highway

N

0 10,000 20,000

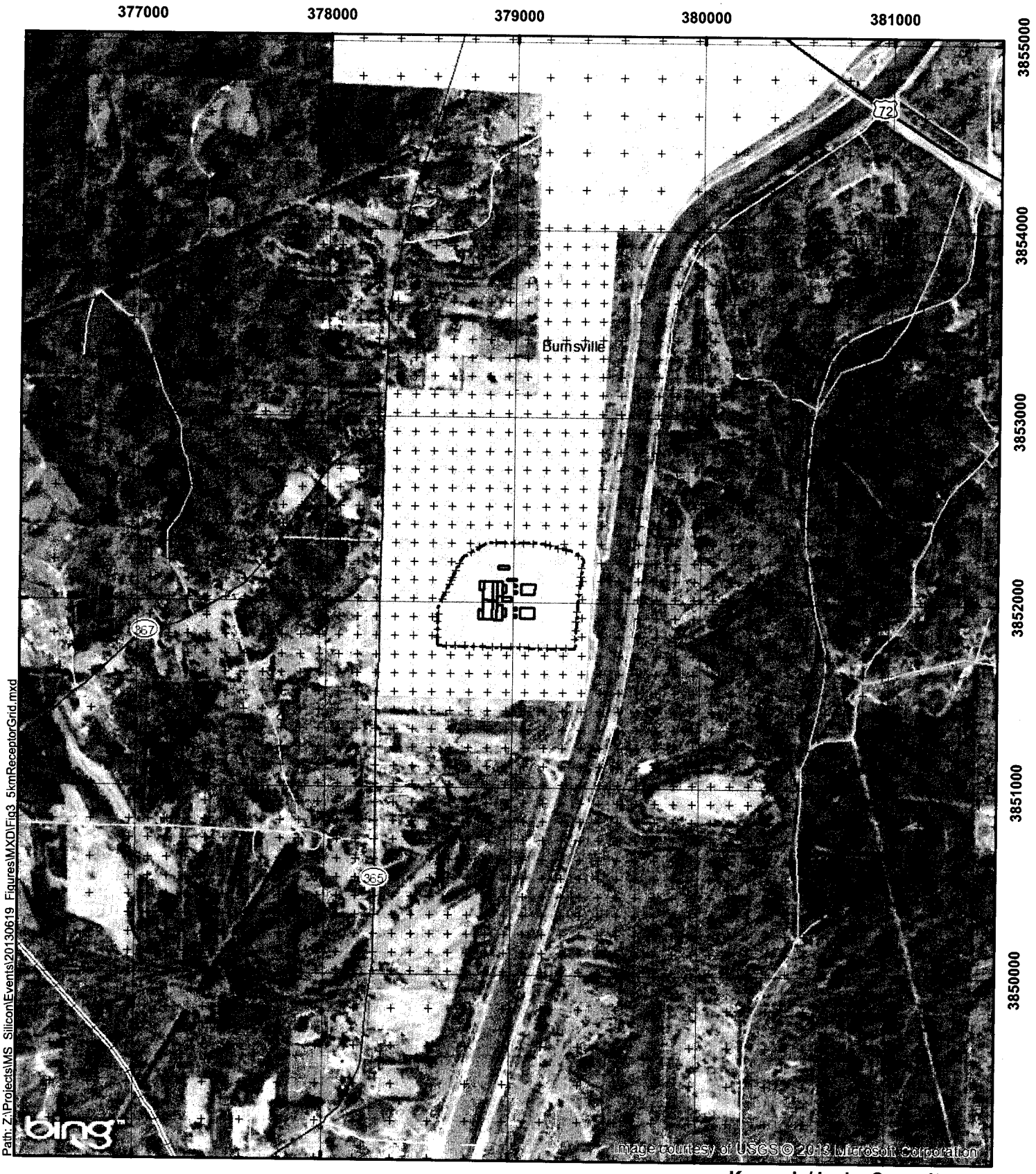
Scale: Feet

Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

50 km Receptor Grid

K/J 1341008*00
August 2013
Figure 5-1



Path: Z:\Projects\MS_Silicon\Events\20130619_Figures\MXD\Fig3_5kmReceptorGrid.mxd

Legend

- Risk Receptors
- Property Boundary
- Buildings
- City Areas
- State Highways
- County Highways
- Local, Rural Roads
- Railroads

N

0 1,000 2,000

Scale: Feet

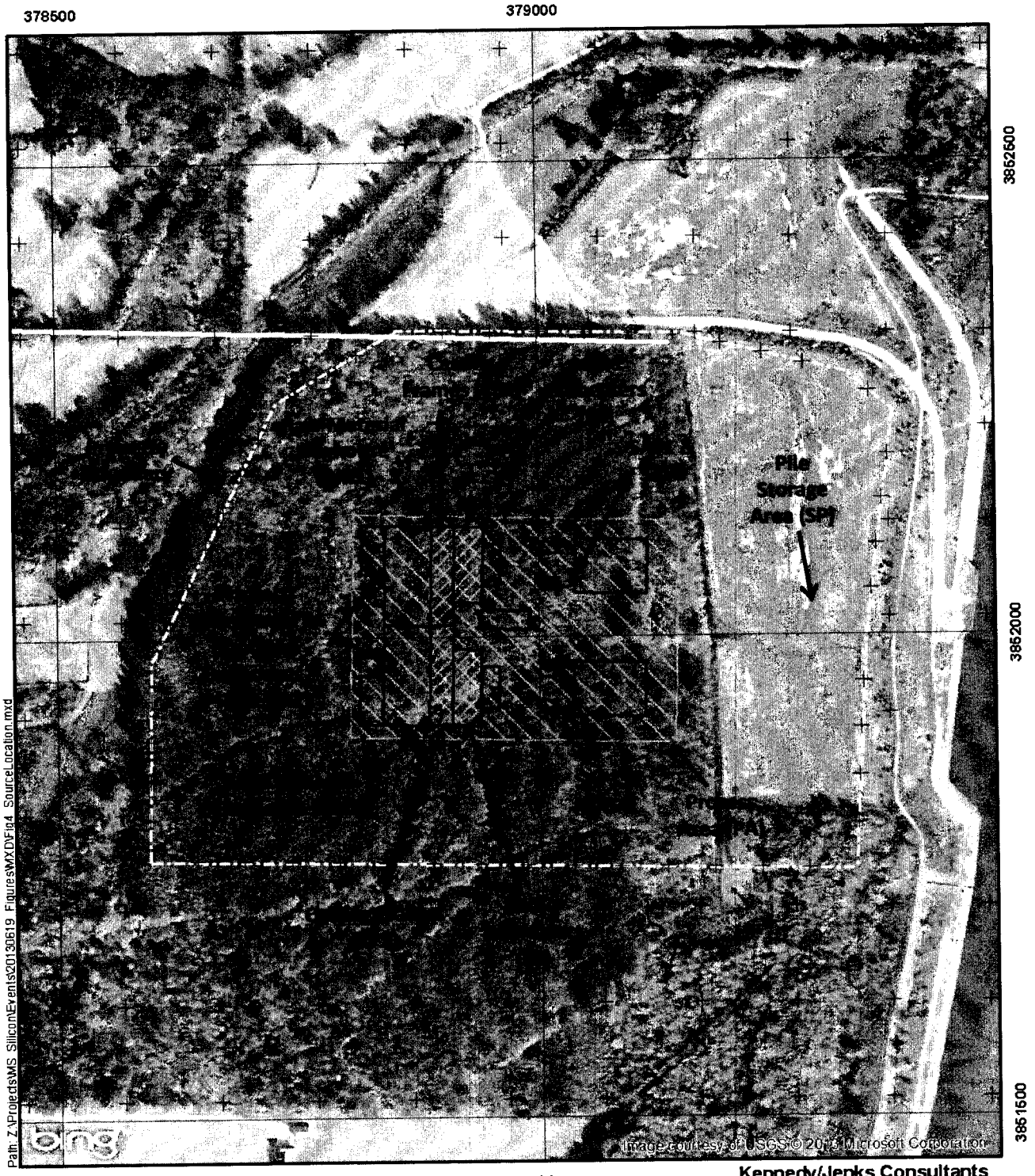
Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

5 km Receptor Grid

K/J 1341008*00
August 2013

Figure 5-2



Legend

- Risk Receptors
- Property Boundary
- Buildings
- Point Source
- Area Source
- Volume Source

N

0 200 400

Scale: Feet

Kennedy/Jenks Consultants

Air Dispersion Modeling
Proposed Silicon Manufacturing Facility
Tishomingo County, Mississippi

Source Location

K/J 1341008*00
August 2013

Figure 5-3

Terrain Contours
meters
236
200
100
98
Tour Guide
1996

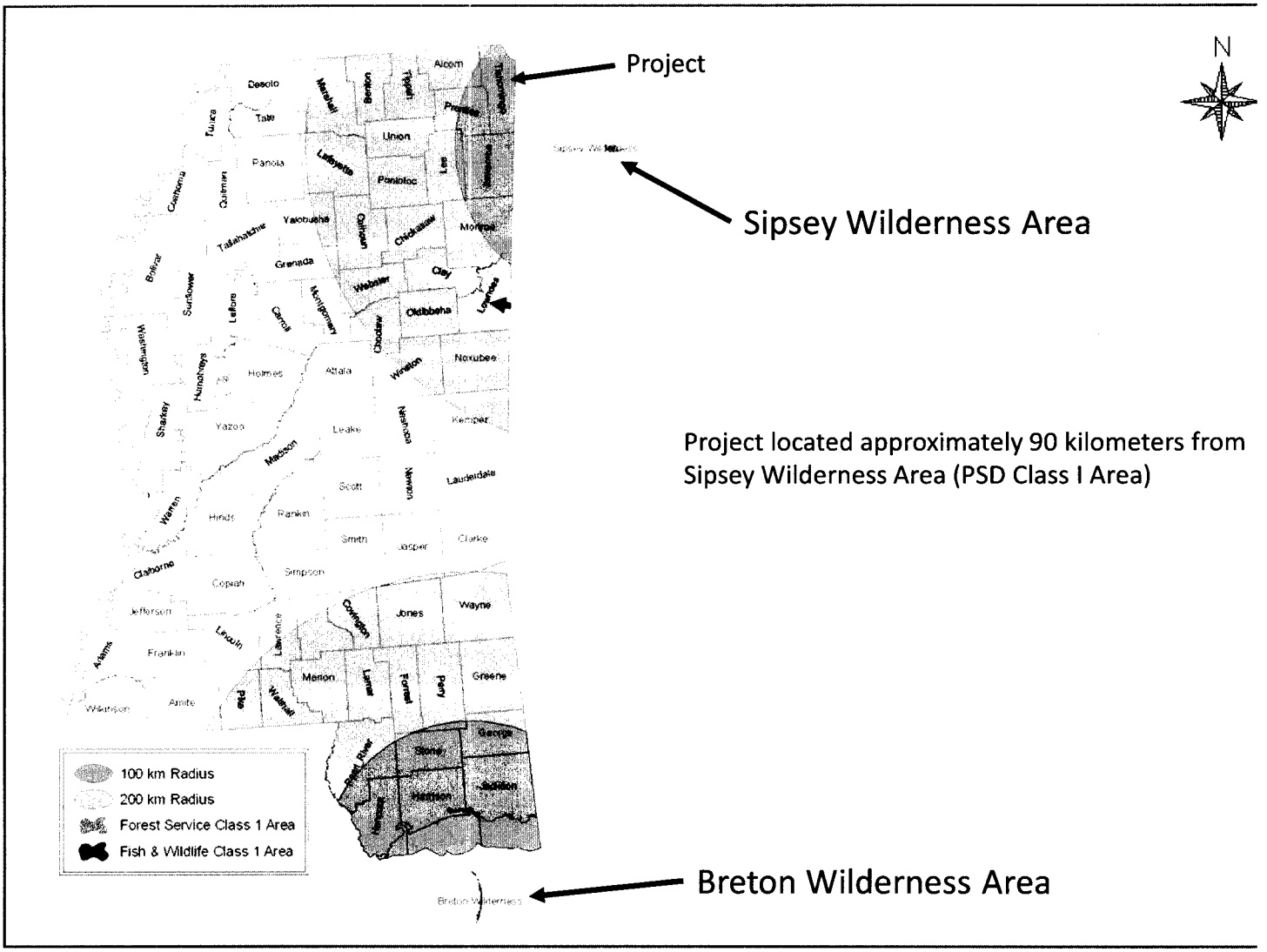


Figure 6-1. Project Location in Relatic

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
August 2013

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Summary of Steps Used in the Air Quality Impact Evaluation (October 2013)

MISSISSIPPI
SILICON

Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
50 Industrial Drive
Burnsville, MS 38847

Date: October 22, 2013

- Step 1 – Evaluated the proposed plant worst case operating conditions including Phases I and II

- Step 2 – Proposed plant will have significant impacts for PM_{10}, $PM_{2.5}$, SO_2 and NO_2. CO has insignificant impact

    - Distance of SIL Area (Table 4 – Addendum #1)

        - PM_{10} – 4 km
        - $PM_{2.5}$ – 7 km
        - NO_2/SO_2 – 50 km

- Step 3 – Proposed plant sets the minor source PSD Class II increment baseline date (Table 5d - Addendum #1). Predicted concentrations below Class II increments

- Step 4 – MDEQ identified one existing source as an SO_2 increment consuming source. This source is Kingsford Manufacturing Company located in Alcorn County, MS. Reran initial receptor grid on October 21, 2013 with MS Silicon sources and Kingsford – No changes in predicted concentrations.

- Step 5 – Modeled proposed plant and existing significant PM_{10} and $PM_{2.5}$ sources on respective SIL areas (Table 10 – Addendum #1). Inclusion of background concentration shows predicted concentrations below NAAQS.

- Step 6 – Modeled proposed plant and existing significant NO_x and SO_2 emission sources (Table 10 – Addendum #1). Predicted concentrations exceeded NO_2 and SO_2 1-hour NAAQS by a factor of 5.

- Step 7 – Performed source culpability analysis to determine contribution from individual existing sources (Table 10a – Addendum #1). Two major contributors identified – Columbia Gas Transmissions and TVA Colbert. ***Modeling run currently running to confirm that no other existing emission source would result in impacts above the corresponding NAAQS. Each individual source is being evaluated to determine its impact on the receptor grid.***

- Step 8 – ***Modeling run currently running to determine predicted concentrations for 1-hour NO_2 and SO_2 excluding the two major contributing sources***. Predicted concentrations resulting from these two sources show numerous receptors exceeding the NO_2 and SO_2 1-hour NAAQS

- Step 9 – Determined the maximum impact of the proposed plant on critical receptors at the two major contributing sources. The maximum point of impact would be receptors located along a line between the MS Silicon plant (center point)

and each of the two contributing sources. Since this is a 1-hour averaging period, the maximum impact downwind of each source was evaluated. The analysis performed was used to demonstrate that the MS Silicon plant does not have a significant 1-hour impact at the maximum point of interaction

- Step 10 – Five (5) receptors spaced at 250 meters were located downwind of the two existing sources along the interaction line. Those receptors were modeled to show the maximum predicted concentrations from the proposed plant (Table 11 – Addendum #1). Predicted concentrations were shown to be below the corresponding SILs. To achieve these predicted concentrations, MS Silicon proposed to limit operation of the 4 SAFs to no more than 2 SAFs operating at any given time. This will be included as an enforceable permit condition by the MDEQ.

Mississippi Silicon Class I SIL Analysis

SIL Analysis with visibility and deposition chemical transformation turned off in CALPUFF

Mingo

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (ug/m3)			SIL Class I Significant Impact Levels (ug/m3)	Maximum Percent of SIL
		2001	2002	2003		
SO2	3-hour (H1H)	0.3954	0.2921	0.1945	1.0	39.5%
	3-hour (H2H)	0.3723	0.1467	0.1658	1.0	37.2%
	24-hour (H1H)	0.1569	0.0741	0.0679	0.2	78.5%
	24-hour (H2H)	0.0585	0.0480	0.0636	0.2	31.8%
	Annual (H1H)	0.0022	0.0018	0.0023	0.1	2.3%
NO2	Annual (H1H)	0.0020	0.0016	0.0021	0.1	2.1%
PM10	24-hour (H1H)	0.0066	0.0021	0.0026	0.3	2.2%
	24-hour (H2H)	0.0025	0.0017	0.0025	0.3	0.8%
	Annual (H1H)	0.000094	0.000068	0.000096	0.2	0.0%
PM2.5	24-hour (H1H)	0.0056	0.0020	0.0022	0.07	8.0%
	24-hour (H2H)	0.0021	0.0015	0.0022	0.07	3.2%
	Annual (H1H)	0.000081	0.000060	0.000083	0.06	0.1%

Sipsey

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (ug/m3)			SIL Class I Significant Impact Levels (ug/m3)	Maximum Percent of SIL
		2001	2002	2003		
SO2	3-hour (H1H)	1.2540	1.0550	1.4359	1.0	143.6%
	3-hour (H2H)	1.1071	0.8076	0.9714	1.0	110.7%
	24-hour (H1H)	0.2846	0.2531	0.3142	0.2	157.1%
	24-hour (H2H)	0.2450	0.2335	0.2622	0.2	131.1%
	Annual (H1H)	0.0121	0.0130	0.0157	0.1	15.7%
NO2	Annual (H1H)	0.0106	0.0115	0.0139	0.1	13.9%
PM10	24-hour (H1H)	0.0178	0.0097	0.0100	0.3	5.9%
	24-hour (H2H)	0.0096	0.0091	0.0094	0.3	3.2%
	Annual (H1H)	0.0005	0.0005	0.0006	0.2	0.3%
PM2.5	24-hour (H1H)	0.0141	0.0085	0.0088	0.07	20.1%
	24-hour (H2H)	0.0075	0.0080	0.0082	0.07	11.7%
	Annual (H1H)	0.0004	0.0004	0.0006	0.06	0.9%

Kennedy/Jenks Consultants

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Air Dispersion Modeling Protocol in Support of Proposed Silicon Manufacturing Facility in Tishomingo County, Mississippi

5 July 2013

MISSISSIPPI
SILICON

Mississippi Silicon, LLC
Proposed Silicon Manufacturing Plant
50 Industrial Drive
Burnsville, MS 38847

K/J Project No. 1341008*00

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Section 1: Introduction to Project

Mississippi Silicon, Inc. (MS Silicon) is proposing to construct a new silicon manufacturing facility (the Project) in Tishomingo County, Mississippi (near Burnsville, Mississippi) (Figure 1). An application for an air permit to construct the Project under the Prevention of Significant Deterioration (PSD) program will be submitted to the Mississippi Department of Environmental Quality (MDEQ) under separate cover during July 2013. This protocol is hereby being submitted to the MDEQ to obtain confirmation that the methodology to be used to perform the air quality impact analysis required under the Prevention of Significant Deterioration (PSD) Air Permit Program is acceptable to the MDEQ.

The Project is proposed to be constructed in an area which is in compliance with all National Ambient Air Quality Standards (NAAQS) and triggers the requirements of PSD review. The air quality impact analysis required under PSD review will be performed for emissions of the following criteria air pollutants associated with the project:

- Oxides of Nitrogen (NO_x);
- Carbon Monoxide (CO);
- Sulfur Dioxide (SO_2);
- Particulate Matter less than 10 microns in aerodynamic diameter (PM_{10});
- Particulate Matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$); and
- Volatile Organic Compounds (VOC) – Conversion to Ozone (O_3).

This document presents the air dispersion modeling protocol which will be followed to demonstrate that the plant will be in compliance with applicable state and federal air quality standards using the AERMOD dispersion model, US EPA's recommended air dispersion model. An air dispersion modeling report will be prepared documenting the procedures used to perform the air dispersion modeling and the results of the modeling. The report may be submitted either under same or separate cover from the application for an air permit to construct the Project.

Kennedy/Jenks Consultants (Kennedy/Jenks), on behalf of MS Silicon is requesting that the MDEQ review this protocol and provide written confirmation that the methodology to be utilized to perform the air quality impact evaluation in support of the PSD permitting process is acceptable to the MDEQ.

Section 2: Applicable Air Quality Regulations

In order to be issued an air permit to construct the new plant under the PSD program, it must be demonstrated that emissions of regulated air pollutants from the plant will not cause or contribute to a violation of the ambient air quality standards for Mississippi, NAAQS, or PSD increments. Additionally, it must be determined whether or not the monitoring de minimis levels can be achieved, thus satisfying the requirement to allow for an exemption from measuring ambient air concentration levels at the proposed facility site. Air dispersion modeling will be utilized to achieve these goals.

2.1 Ambient Air Quality Standards and PSD Increments

Air dispersion modeling will demonstrate whether or not one year of pre-construction monitoring data must be submitted for the applicable regulated criteria air pollutants by comparing predicted concentrations due to regulated air pollutant emissions from the Project with the Significant Monitoring Concentrations (SMCs). If the Project impacts are below the SMCs, the Project is assumed to be exempt from any pre-construction, as well as post-construction requirements under the PSD program.

The section of this protocol "Background Concentration Included in the NAAQS Compliance Demonstration" includes information on ambient air monitoring being performed in the area of the Project. This data has been gathered for the purpose of determining whether emissions of PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO and VOC from the Project might cause or contribute to a violation of the NAAQS or PSD Increments and is assumed to satisfy the pre-construction monitoring requirement should the modeled impacts of the Project exceed any applicable SMC.

Section 3: Selected Air Dispersion Model for the Project

The most recent version of AERMOD View (Version 8.2.0), developed by Lakes Environmental Software will be utilized for this project. AERMOD View incorporates the U.S. EPA regulatory models AERMOD, ISCST3 and ISC-PRIME, developed by The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC), into a single interface. Regulatory default options available in the model will be used for the compliance demonstrations.

AERMET View will be used to prepare the input for AERMOD View. The output from AERMOD View will be processed by POST View which provides a graphical interface with geographic information system (GIS) capabilities to enhance the AERMOD View model and aid the user with organizing and evaluating AERMOD View output files. The U.S. EPA's approved regulatory AERMOD code which is used to predict ambient concentrations is unaltered by AERMOD View and accompanying software packages.

The AERMOD View model family consists of several supporting pre-processor and post-processed models in addition to those mentioned above. The following list summarizes the versions of AERMOD VIEW family software that will be used for this air dispersion modeling analysis:

- AERMOD View 8.2.0;
- AERMET View 8.2.0;
- Building Profile Input Program for Prime (BPIPPRM) Version 04274;
- AERMAP 11103;
- AERSURFACE 13016; and
- POST View 8.2.0;

Section 4: Model Input and Support Data

Several data elements are required as input into to support the dispersion model AERMOD View, including:

- Representative hourly meteorological data;
- Potential points of predicted impacts, referred to as receptor points; and
- Terrain elevations for each individual receptor point.

Each of these data elements are discussed in the subsequent sections of this protocol.

4.1 Meteorological Data Selection and Pre-processing

MDEQ provides AERMOD View-ready meteorological (met) data sets consisting of five years of met data on their web site at the following url:

http://www.deq.state.ms.us/MDEQ.nsf/page/epd_AERMET_Preprocessedmetdata?OpenDocument

The North East Region met data set with surface data from the Tupelo Regional Airport and upper air data from Jackson provided by MDEQ is considered representative of the Project site. The met data was processed with AERMET View. The most recent five years of the met data, 1991 through 1995, will be used for this air dispersion modeling project.

4.2 Coordinate System and Receptor Network

The AERMOD model objects will use the North American Datum of 1983 (NAD83).

The receptor grid will be designed to identify the maximum points of air quality impact due to the Project and consisted of receptors extending at least 10 kilometers from the Project site. The ambient air boundary is defined by features which preclude public access from the Project site. Receptors will be closely spaced (50 meters) along the Project site's ambient air boundary to identify the influence of aerodynamic building downwash. The following receptor spacing will be used for the receptor grid:

- 50-meter spacing along the ambient air boundary of the Project site;
- 100-meter spacing from the Project fence line to one kilometer out from the Project site;
- 200-meter spacing from one kilometers to two kilometers from the Project site;
- 500-meter spacing from two kilometers to five kilometers from the Project site;
- 1,000-meter spacing from five kilometers to ten kilometers from the Project site; and
- 2,000-meter spacing from ten kilometers to twenty kilometers from the Project site.

4.3 Terrain Data Selection and Pre-processing

Terrain data will be assigned to the receptor networks using the latest version of AERSURFACE, a utility in AERMET View, and national elevation data (NED) files at 1-arc second resolution obtained from the United States Geological Survey (USGS) seamless data warehouse server. The elevation of buildings and sources on the site will be based upon the planned finished grading of the site.

Section 5: Project Emission Inventory

The emission inventory of the Project will be based on the potential to emit emission rates provided in the PSD air permit application. The inventory will be described in detail and provided with detailed backup calculations in the air permit application.

Consistent with the guidance in the memo "Additional Clarification Regarding the Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" (March 1, 2011 U.S. EPA Office of Air Quality Planning and Standards), the emissions of emergency and limited use equipment may be eliminated from the emission inventory. This guidance requires that compliance demonstrations "address emission scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly" to the statistical form for the NAAQS of concern.

For purposes of this Project, potential impacts from any emergency generators and fire pumps will not be included in the air quality impact evaluation for all criteria air pollutants being evaluated in the air quality impact evaluation, since the intended use of this emergency equipment will be limited, which would include 1 to 2 hours of actual use per month for testing purposes. The memorandum identified above for NO_2 is also being applied to other criteria air pollutants being evaluated from emergency equipment associated with this project.

Section 6: Determination of the Significance of Project Contributions to Ambient Air Concentrations

The inventory of Project emissions will be modeled, and the predicted ambient air concentrations will be compared with the PSD Class II SILs. If the predicted concentrations are less than the SILs, the project is demonstrated to not cause or contribute to a violation of the NAAQS or PSD Class II Increments. If predicted concentrations exceed the SILs, further modeling is required to demonstrate that the project will not cause or contribute to a violation of the NAAQS or PSD Class II Increments. The significant impact area (SIA) is defined as the set of receptors at which predicted concentrations due to emissions from the Project are predicted to equal or exceed the SIL. Table 1 provides a summary of applicable SILs.

Section 7: Determination of Requirement for Pre-Construction Monitoring

The inventory of Project emissions will be modeled, and the predicted ambient air concentrations will be compared with the SMCs. If the predicted concentrations are less than the SMCs, the Project will be exempt from the requirements to conduct pre or post construction monitoring under the PSD program. Table 2 provides a summary of the applicable SMCs. The statistical form of the modeled concentration is based on a 5-year National Weather Service met data set.

Section 8: Multisource Impact Analysis for Demonstration of Compliance with the NAAQS

Should any SIL be exceeded due to regulated air pollutant emissions from the Project, a multisource impact analysis will be required to demonstrate that the Project will not cause or contribute to a violation of the NAAQS. The multisource demonstration will include – in addition to regulated air pollutant emissions from the project – emissions of regulated air pollutants from other Non-Project sources in the area within the modeled source inventory and a background concentration based on representative ambient monitoring data. Table 3 provides a summary of the applicable NAAQS. The statistical form of the modeled concentration is based on a 5-year National Weather Service met data set.

8.1 Inventory of Non-Project Sources Included in the NAAQS Compliance Demonstration

The inventory of Non-Project sources to be included in the NAAQS compliance demonstration will be requested from MDEQ for sources located in Mississippi, Alabama Department of Environmental Management (ADEM) for sources located in Alabama and Tennessee Department of Environment and Conservation for sources located in Tennessee. The inventory will include all permitted sources within 50 kilometers of the Project's SIA for each applicable criteria pollutant with allowable emission rates.

As part of this protocol the applicant formally requests that the MDEQ provide emission inventories for existing sources within a distance of 75 kilometers from the City of Burnsville, located in Tishomingo County, MS.

The "North Carolina 20D Rule" (20D Rule) may be applied by the following procedure to the inventory of Non-Project sources to screen out sources which are not expected to cause a significant concentration gradient:

1. Sources within the SIA will not be screened out of the inventory
2. The distance "D" for each source is defined as the distance in kilometers from (a) the source being screened to the nearest edge of the SIA for annual average analyses, and (b) the source being screened to the Project site for short-term (24-hour or less) average analyses.
3. Non-Project source emissions "Q" are defined as the sum of allowable emissions for each facility in tons/year.
4. Non-Project sources with Q/D ratio less than 20 are screened out of the inventory of Non-Project sources and not included in the modeling for the multisource impact analysis for demonstration of compliance with the NAAQS.

8.2 Background Concentration Included in the NAAQS Compliance Demonstration

The NAAQS compliance demonstration for each pollutant will be based on a Tier 1 screening method which includes a background concentration for each pollutant. The background concentration will equal the most recent NAAQS design concentration from the nearest representative monitor. The background concentration and modeled concentration from the multisource impact analysis will be summed and compared with the NAAQS in the Tier 1 screening method. The statistical form of the concentration will be based on the three most recent complete years of monitoring data (2010-2012) at the monitors.

Monitor data for determination of the background concentrations will be obtained from several sources including the following:

- Downloadable yearly raw data sets at the Air Quality System (AQS) Data Mart (http://www.epa.gov/ttn/airs/airsaqs/detaildata/downloadaqsdata.htm)
- MDEQ Annual Air Quality Data Summary Reports (http://www.deq.state.ms.us/MDEQ.nsf/page/Air_CriteriaandHazardousAirPollutantMonitoring?OpenDocument)
- State of Alabama Ambient Air Monitoring 2011 Consolidated Network Review (http://www.adem.state.al.us/programs/air/airquality/2011AmbientAirPlan.pdf)

Kennedy/Jenks is requesting that the MDEQ provides appropriate background concentrations to be used for this air permitting process.

Section 9: Multisource Impact Analysis for Demonstration of Compliance with the PSD Class II Increments

Should any SIL be exceeded due to emissions from the Project, a multisource impact analysis will be required to demonstrate that the Project will not cause or contribute to an exceedance of any PSD Class II Increment. The multisource demonstration will include – in addition to emissions from the project – emissions from other Non-Project sources in the area within the modeled source inventory. Table 4 provides a summary of the applicable PSD Class II Increments. The statistical form of the modeled concentration is based on a 5-year National Weather Service met data set.

9.1 Inventory of Non-Project Sources Included in the PSD Class II Increment Compliance Demonstration

The proposed project will most likely trigger the minor source baseline date, thus will be the only increment consuming emission source for criteria air pollutants from this project for this county (baseline dates have not yet been defined for this county).

Section 10: Pollutant Specific Considerations

10.1 NO_x and NO_2 Tiered Screening Analysis

The applicant proposes to use a Tier 2 screening analysis for demonstrating compliance with the NO_2 NAAQS in which the ambient ratio of NO_2 to NO_x is 0.80 for the 1-hour averaging period and 0.75 for the annual averaging period. The assumptions of Tier 2 should be accepted without further justification per the recommendations of the EPA Office of Air Quality Planning and Standards memo "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" issued March 1, 2011. The Tier 2 approach will be implemented by modeling NO_x emission rates and scaling the predicted 1-hour concentrations by a factor of 0.80 and the predicted annual concentrations by a factor of 0.75.

If the applicant is unable to demonstrate compliance with the NO_2 NAAQS using the Tier 2 screening analysis, the applicant may request the use of a Tier 3 screening analysis based on the Ozone Limiting Method (OLM) or Plume Volume Molar Ratio Method (PVMRM) for the compliance demonstration. An additional modeling protocol which details the implementation of the Tier 3 screening analysis will be submitted to MDEQ if such an analysis is to be performed.

10.2 PM_{10} and $PM_{2.5}$ Filterable and Condensable Portions

The emission inventories of PM_{10} and $PM_{2.5}$ from the Project will include both the filterable and condensable portions of PM_{10} and $PM_{2.5}$ emissions.

10.3 PM_{10} and $PM_{2.5}$ Precursors

The emission inventories of PM_{10} and $PM_{2.5}$ from the Project will include only direct emissions of PM_{10} and $PM_{2.5}$. Formation of PM_{10} and $PM_{2.5}$ in the atmosphere due to emissions of precursor chemicals will not be considered (except to the extent which precursor emissions form particulate matter quantified as condensable particulate matter, which is included in the emission inventory as direct emissions of PM_{10} and $PM_{2.5}$). This approach is consistent with current EPA policy since no formal guidance or methodology exists for addressing precursors.

Section 11: PSD Class I Screening Analysis

The Project site is located approximately 135 kilometers from the Sipsey Wilderness Area (Sipsey) which is a PSD Class I Area. Impacts to Sipsey due to emissions from the Project should be addressed due to the proximity of the Project to Sipsey. Impacts to Sipsey will be analyzed using the following initial screening criteria recommended in "Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase I Report – Revised (2010)" (Natural Resource Report NPS/NRPC/NRR-2010/232):

1. Define the Project emissions "Q" as the sum of annual potential emissions (assuming 8,760 operating hours) of SO_2, NO_x, PM_{10}, and H_2SO_4 in tons per year.

2. Define the distance "D" as the distance between the project site and the nearest edge of the PSD Class I Area (Sipsey) in kilometers.

3. The Project is considered to have negligible impacts with respect to Class I Air Quality Related Values (AQRVs), including PSD Class I Increments and visibility impairment, if the ratio of Q/D is less than 10. No further analysis, such as dispersion modeling, is required in this case.

4. If the project ratio of Q/D is greater than 10, Kennedy/Jenks will work with the MDEQ/Federal Land Manager to define the appropriate analysis to be performed.

Section 12: Ozone Air Quality Impact Evaluation

The proposed project will have potential emissions of VOC in excess of 100 tons/year. Subsequently, under the PSD program, any project with potential emissions of VOC exceeding 100 tons/year is subject to the requirement to conduct an air quality impact evaluation.

EPA has not established a standard approach for performing an air quality impact evaluation for emissions of VOC and its effect on ozone air quality. For purposes of this project, we will be utilizing an approach previously used in support of other PSD permitting projects in EPA Region IV. This approach will involve using technical data developed in support of the Atlanta, Georgia ozone SIP. This data identifies the change in ozone air quality that will occur based on the amount of VOC/NO_x emissions introduced into the atmosphere on a ton/year basis. Essentially, a factor has been developed from this SIP process that identifies the change in ozone concentration (ppb or ppm) based on the total combined increase in VOC and NO_x emissions in tons/year.

The resultant change in ozone concentration ill then be multiplied by the representative ozone background concentration to demonstrate the resultant concentration will be below the 8-hour ozone NAAQS.

Table 1: Summary of Applicable PSD Class II SILs

Pollutant	Averaging Period	Class II SIL (ug/m^3)	Statistical Form of Modeled Concentration (At Each Receptor)
PM_{10}	24-hour	5	Highest first high of the 5 years
	Annual	1	Highest of the 5 years
$PM_{2.5}$	24-hour	1.2	Average of the highest from each year
	Annual	0.3	Average of the highest from each year
NO_2	1-hour	7.52	Average of the highest maximum daily 1-hour concentration from each year
	Annual	1	Highest of the 5 years
SO_2	1-hour	7.8	Average of the highest maximum daily 1-hour concentration from each year
	3-hour	25	Highest first high of the 5 years
	24-hour	5	Highest first high of the 5 years
	Annual	1	Highest of the 5 years
CO	1-hour	2,000	Highest first high of the 5 years
	8-hour	500	Highest first high of the 5 years

Table 2: Summary of Applicable SMCs

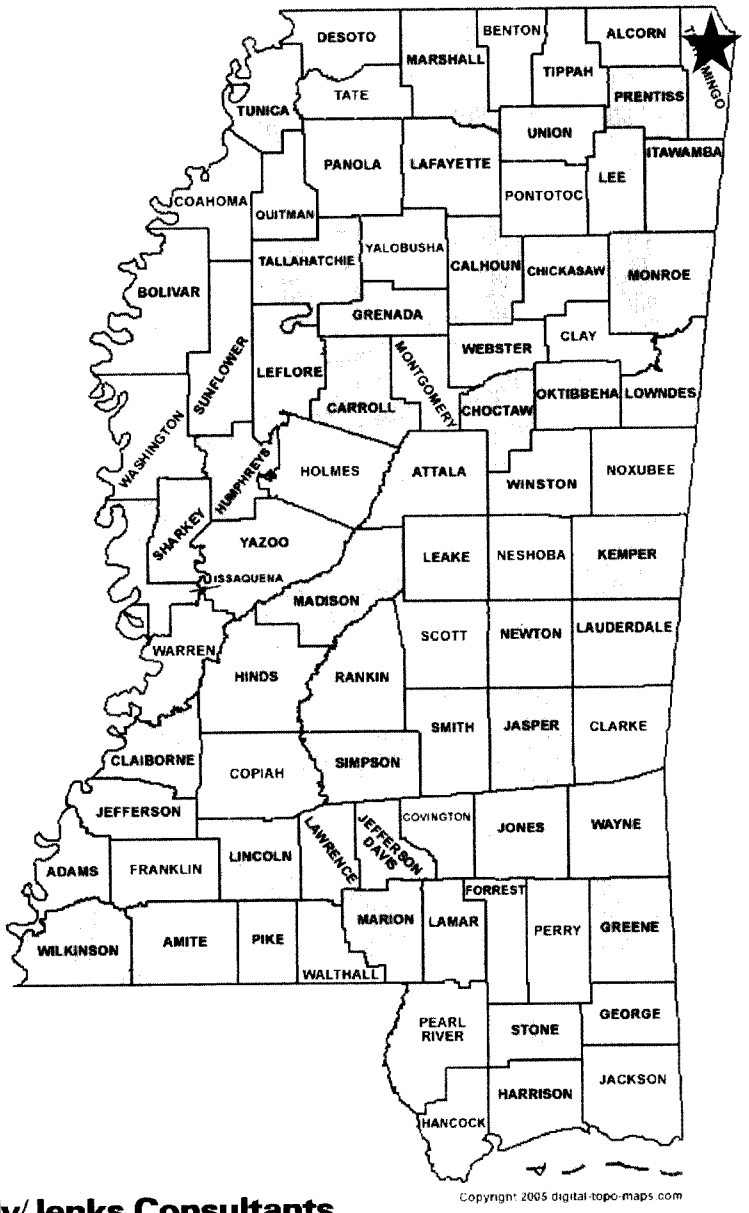
Pollutant	Averaging Period	SMC (ug/m^3)	Statistical Form of Modeled Concentration (At Each Receptor)
PM_{10}	24-hour	10	Highest first high of the 5 years
$PM_{2.5}$	24-hour	4	Average of the highest from each year
NO_2	Annual	14	Highest of the 5 years
SO_2	24-hour	13	Highest first high of the 5 years
CO	8-hour	575	Highest first high of the 5 years

Table 3: Summary of Applicable NAAQS

Pollutant	Averaging Period	NAAQS (ug/m^3)	Statistical Form of Modeled Concentration (At Each Receptor)
PM_{10}	24-hour	150	Sixth highest over 5 years (the NAAQS is not to be exceeded more than once per year on average)
	Annual	--	--
$PM_{2.5}$	24-hour	35	Average of the eighth highest (98'th percentile) from each year
	Annual	15	Average of the highest from each year
NO_2	1-hour	188	Average of the eighth highest (98'th percentile) maximum daily 1-hour concentration from each year
	Annual	100	Highest of the 5 years
SO_2	1-hour	196	Average of the fourth highest (99'th percentile) maximum daily 1-hour concentration from each year
	3-hour	1,300	Highest of the second high from each of the 5 years
	24-hour	365	Highest of the second high from each of the 5 years
	Annual	80	Highest of the 5 years
CO	1-hour	40,000	Highest of the second high from each of the 5 years
	8-hour	10,000	Highest of the second high from each of the 5 years

Table 4: Summary of Applicable PSD Class II Increments

Pollutant	Averaging Period	PSD Class II Increment (ug/m^3)	Statistical Form of Modeled Concentration (At Each Receptor)
PM_{10}	24-hour	30	Highest of the second high from each of the 5 years
	Annual	17	Highest of the 5 years
$PM_{2.5}$	24-hour	9	Highest of the second high from each of the 5 years
	Annual	4	Highest of the 5 years
NO_2	Annual	25	Highest of the 5 years
SO_2	3-hour	512	Highest of the second high from each of the 5 years
	24-hour	91	Highest of the second high from each of the 5 years
	Annual	20	Highest of the 5 years



★ Location of Proposed Pla

Kennedy/Jenks Consultants

Engineers & Scientists

Figure 1. Map of Mississippi Counties
Proposed Plant

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
July 2013

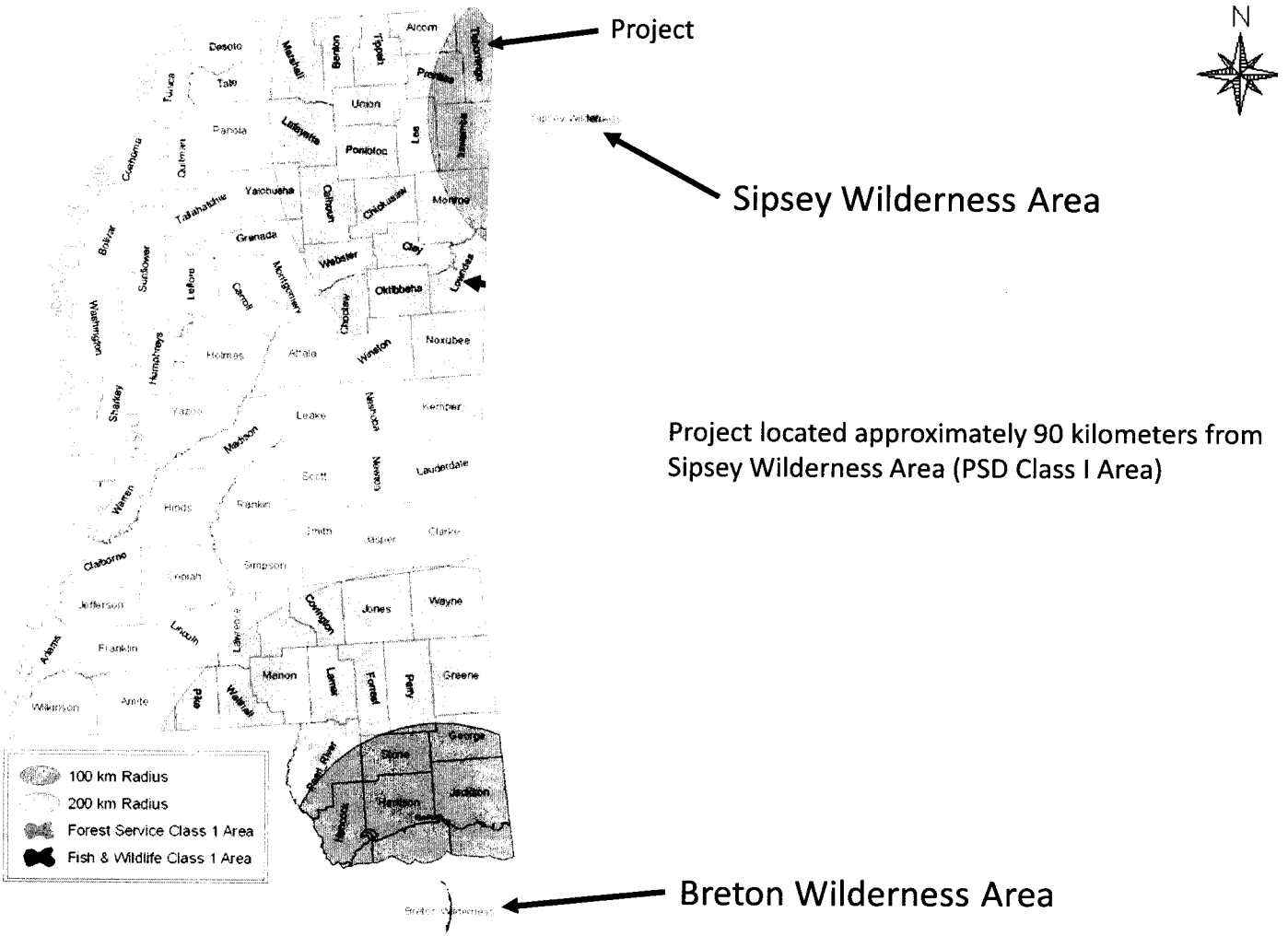


Figure 2. Project Location in Relation

MS Silicon
Proposed Silicon Manufacturing Plant
Burnsville, Mississippi
July 2013

Kennedy/Jenks Consultants
Engineers & Scientists

Meteorological Solutions Inc

October 9, 2013

Mr. Steven Frey
Manager Air Quality
Kennedy/Jenks Consultants
1515 East Woodfield Road, Suite 360
Schaumburg, Illinois 60173

Dear Mr. Frey:

Per our conversation today, please find attached an Executive Summary describing the impacts of Mississippi Silicon emission sources on the Mingo and Sipsey Class I areas.

If you have any questions regarding this report, feel free to contact me.

Sincerely,

Scott Adamson
Meteorologist/Dispersion Modeler

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4525 Wasatch Blvd. | Suite 200 | SLC, UT 84124
Phone: 801-272-3000 | Fax: 801-272-3040
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Attachment A
PSD Class I Air Quality Analysis Executive Summary

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EXECUTIVE SUMMARY

A Prevention of Significant Deterioration (PSD) Class I ambient air quality analysis was conducted for the emission sources associated with Mississippi Silicon, LLC proposed silicon manufacturing plant to be located in Tishomingo County, near the town of Burnsville, Mississippi. The air dispersion modeling analyses were conducted to evaluate the air quality impact on two Class I areas, Sipsey and Mingo Wilderness areas, which are located within a 300 kilometer radius of the proposed plant. The air modeling analyses evaluated the potential air quality impacts on the Sipsey and Mingo Wilderness areas and included the Class I Area Increment and Air Quality Related Values (AQRVs) which evaluated the Class I Significant Impact Levels (SILs), visibility impairment, and sulfate and nitrate deposition impacts.

To perform the Class I area analyses, the CALPUFF Modeling System (CALPUFF (Version 5.8), CALMET (Version 5.8), and CALPOST (Version 6.221)) which is the long range transport model recommended by the draft Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report—Revised (2010), was utilized. CALPUFF is a non-steady state Lagrangian Gaussian puff long-range transport model that includes algorithms for building downwash effects, as well as chemical transformations (important for visibility controlling pollutants), and wet/dry deposition. CALPUFF uses the wind fields generated by CALMET to make the transport and dispersion calculations.

CALMET, the meteorological preprocessor for CALPUFF, is a diagnostic meteorological model that produces three-dimensional wind and temperature fields and two-dimensional fields of other meteorological parameters. The Class I air dispersion modeling analysis was performed using the CALMET dataset which was developed through the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) Best Available Retrofit Technology (BART), commonly referred to as the VISTAS CALMET dataset. The VISTAS CALMET dataset is available for 5 sub domains. The VISTAS CALMET dataset for Sub Domain 1 was utilized for the Sipsey Wilderness Area; sub Domain 3 was utilized for the Mingo Wilderness Area.

The VISTAS CALMET dataset incorporated meteorological surface and upper air as well as precipitation stations which were provided to the CALMET model during processing. Monthly CALMET.DAT files were used for years 2001, 2002, and 2003. Ozone data were extracted using CalPro from a standard ozone dataset associated with the VISTAS CALMET dataset (Sub Domain 1 or 3).

Geophysical data such as terrain and land use is a necessary input to the CALMET model. The geophysical data utilized was included as part of the VISTAS CALMET dataset.

POSTUTIL (Version 1.56), a program that transforms particle size species to new species and produces the necessary concentration files that are then used by CALPOST for post-processing of results, was used for these analyses. The CALPOST model was used to calculate the concentration results for comparison to the modeling significance levels and the deposition flux for total sulfur and nitrogen. CALPOST was also used to carry out the visibility analysis. The CALPUFF modeling system switch settings and model options were based a combination of Interagency Workgroup on Air Quality Modeling (IWAQM) recommended switch settings and successive switch settings recommended in the Federal Land Managers (FLM) CALPUFF Reviewer's guide-FNL-20110523.

The air dispersion modeling analysis evaluated the potential impact of the emissions from proposed silicon manufacturing plant. Emission data and source characteristic information for the proposed silicon manufacturing plant were provided by Kennedy Jenks. Point, area, and volume sources were included in the model. Discrete receptors for Sipsey and Mingo Wilderness areas, downloaded from the National Park Service (NPS) web site at http://www.nature.nps.gov/air/maps/receptors/index.cfm were used to calculate air quality and visibility impacts.

The maximum concentrations of SO_2, NO_2, PM_{10}, and $PM_{2.5}$ at the Sipsey and Mingo Wilderness Areas were compared with Class I Significant Impact Levels (SILs). According to guidance, if maximum concentrations are below the SILs, then emissions from the facility are assumed to be insignificant and no further analysis is needed. Tables E-1 and E-2 present the results of the air dispersion modeling analysis for the Mississippi Silicon, LLC facility and compares the modeled concentrations at Sipsey and Mingo, respectively, to the Class I SILs. With the exception of three-hour and 24-hour SO_2 concentrations for 2001 and 2003, results indicate that all modeled concentrations are well below the SILs. For pollutant concentrations below the SIL, the emissions from the Mississippi Silicon, LLC facility are assumed to be insignificant which means that emissions from the proposed facility will not have the potential to cause or contribute to an exceedance of an ambient air quality standard or PSD increment. At this time the Mississippi Department of Environmental Quality (MDEQ) and FLM's have not required a cumulative increment analysis to be conducted.

Table E-1

CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Sipsey Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations ($\mu g/m^3$)			SIL Class I Significant Impact Levels ($\mu g/m^3$)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.8775	0.5986	**1.2454**	1.0	**124.5**
	3-hour (H2H)	0.6231	0.5672	0.9001	1.0	90.0
	24-hour (H1H)	**0.2371**	0.1958	**0.2551**	0.2	**127.5**
	24-hour (H2H)	0.1548	0.1947	**0.2235**	0.2	**111.7**
	Annual (H1H)	0.0074	0.0082	0.0104	0.1	10.4
NO_2	Annual (H1H)	0.0050	0.0058	0.0070	0.1	7.0
PM_{10}	24-hour (H1H)	0.0071	0.0046	0.0044	0.3	2.4
	24-hour (H2H)	0.0050	0.0031	0.0041	0.3	1.7
	Annual (H1H)	0.0002	0.0002	0.0002	0.2	0.11
$PM_{2.5}$	24-hour (H1H)	0.0139	0.0077	0.0081	0.07	19.8
	24-hour (H2H)	0.0074	0.0074	0.0072	0.07	10.62
	Annual (H1H)	0.0004	0.0003	0.0004	0.06	0.73

Table E-2

CALPUFF Maximum Modeled Concentrations and Comparison to the PSD Class I SILs for Mingo Wilderness Area

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (µg /m3)			SIL Class I Significant Impact Levels (µg /m³)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.0798	0.2387	0.1317	1.0	23.9
	3-hour (H2H)	0.0636	0.1173	0.0794	1.0	11.7
	24-hour (H1H)	0.0243	0.0563	0.0305	0.2	28.1
	24-hour (H2H)	0.0401	0.0313	0.0252	0.2	20.1
	Annual (H1H)	0.0006	0.0008	0.0008	0.1	0.85
NO_2	Annual (H1H)	0.0004	0.0002	0.0003	0.1	0.36
PM_{10}	24-hour (H1H)	0.0004	0.0011	0.0007	0.3	0.36
	24-hour (H2H)	0.0003	0.0006	0.0006	0.3	0.21
	Annual (H1H)	0.0000	0.0000	0.0000	0.2	0.01
$PM_{2.5}$	24-hour (H1H)	0.0012	0.0019	0.0020	0.07	2.9
	24-hour (H2H)	0.0010	0.0014	0.0019	0.07	2.7
	Annual (H1H)	0.0000	0.0000	0.0000	0.06	0.07

A visibility impairment analysis was conducted in order to determine if the Mississippi Silicon, LLC facility would have an adverse impact on visibility at the Sipsey and Mingo Wilderness Areas. The analysis was done using the CALPOST following the methods and options outlined under the FLAG 2010 guidance with MVISBK = 8 and the background light extinction based on the "cleanest 20%" days for each wilderness area. The visibility threshold is exceeded if the predicted change in light extinction exceeds 5% based on the 98th percentile (eighth highest day for a year) in any single year modeled. The CALPUFF/CALPOST visibility results for the Mississippi Silicon, LLC facility were compared to the "cleanest 20%" background and were found to be below the 5% (based on the 98th percentile calculation) for the cleanest 20% background condition. These results for Sipsey and Mingo Wilderness areas are presented in Tables E-3 and E-4, respectively.

Table E-3

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Sipsey Wilderness Areas

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	3.03%	3.20%	2.35%	64.0
2	2.90%	2.97%	2.19%	59.4
3	2.60%	2.41%	2.07%	52.0
4	2.54%	1.69%	1.98%	50.8
5	2.41%	1.68%	1.95%	48.2
6	2.13%	1.61%	1.95%	42.6
7	1.97%	1.59%	1.64%	39.4
8	1.69%	1.41%	1.58%	33.8

Table E-4

Eight Highest Daily Delta-Deciview Change for Cleanest 20% for Mingo Wilderness Areas

Rank	2001 Percent Extinction	2002 Percent Extinction	2003 Percent Extinction	Maximum % of Threshold
1	1.04%	0.46%	1.06%	21.2
2	0.55%	0.39%	0.99%	19.8
3	0.54%	0.37%	0.91%	18.2
4	0.52%	0.35%	0.70%	14
5	0.44%	0.29%	0.66%	13.2
6	0.37%	0.28%	0.51%	10.2
7	0.34%	0.25%	0.44%	8.8
8	0.30%	0.24%	0.34%	6.8

Total sulfur and total nitrogen deposition analyses were performed for Sipsey and Mingo Wilderness areas. For the deposition analysis, POSTUTIL was used to combine the wet and dry flux output files from CALPUFF and scale the contributions of SO_2, SO_4, NO_x, NO_3, and HNO_3 such that total nitrogen (N) and total sulfur (S) flux were contained in the same file. The model results were compared to the 0.01 kg/ha/year Deposition Analysis Threshold (DAT) developed by the NPS and the U.S. Fish and Wildlife Service (FWS) for the Eastern Class I Areas. The results of this analysis are provided in E-5 and E-6 for Sipsey and Mingo, respectively.

Table E-5

Sulfur and Nitrogen Deposition Flux Results for Sipsey Wilderness Area

Pollutant	Total Modeled Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0068	0.0087	0.0087	0.01	87.1
Nitrogen (N)	0.0028	0.0036	0.0037	0.005	73.1

Table E-6

Sulfur and Nitrogen Deposition Flux Results for Mingo Wilderness Area

Pollutant	Total Modeled Deposition (kg/ha/yr)			DAT Deposition Analysis Threshold (kg/ha/yr)	% of DAT
	2001	2002	2003		
Sulfur (S)	0.0010	0.0010	0.0016	0.01	16.4
Nitrogen (N)	0.0005	0.0004	0.0007	0.005	14.8

Pre-Construction Review

and

Preliminary Determination

of Approval for

Mississippi Silicon LLC

Facility No. 2640-00060

Technical Review
by
Bonnie Morgan

Air Quality Analysis
By
Jacqueline Evans

October 21, 2013

I. General Information

Mississippi Silicon LLC, East of County Roads 210 and 365 in Burnsville, Mississippi, 38833 has submitted a complete air permit application for a Prevention of Significant Deterioration Construction Permit to Construct Air Emissions Equipment.

The latitude and longitude of the facility is 38°, 48', 21.4" and 88°, 19', 15.5", respectively. The emission points for the project are around this area.

The Standard Industrial Classification (SIC) Codes for the facility is 3339 for Primary Nonferrous Metals for the manufacturing of Silicon.

II. Description of Proposed Plant

MS Silicon is proposing the construction of a silicon manufacturing plant in Burnsville, Mississippi, which is located in Tishomingo County. The plant will consist of two (2) specific process areas:

- Silicon manufacturing; and
- Support operations.

The silicon manufacturing process will involve the mixing of quartz, coal, and wood in a semi-enclosed submerged arc furnace to produce 98% pure silicon. Further processing is performed to produce the 98% pure silicon in the form of an ingot or flake. The silicon manufacturing process will include the following operations with the potential to emit regulated air pollutants:

- Material handling and transfer to and from coal, wood and quartz storage piles;
- Storage yard for coal, wood and quartz storage piles;
- Wind erosion from coal, wood and quartz storage piles;
- Wood chipper (electric-fired);
- Casting frames;
- Raw material day bins with supporting baghouse(s);
- Four (4) semi-enclosed submerged arc furnaces (SAF) with four (4) baghouses;
- Four (4) ladle pre-heaters; and
- Product refining operations with supporting baghouse(s).

The silicon manufacturing process (i.e., the meltshop operations) will include melting, transferring and cooling operations. The raw material day bins, identified as emission group AA-101a, AA-102a and AA-103a, will be used to support the semi-enclosed submerged arc furnaces. The raw materials from the storage piles will be transferred to the raw material day bins before being loaded into the semi-enclosed submerged arc furnaces. Material will be mechanically (i.e., front end loaders or other types of equipment) moved to reclaim areas where the materials will be conveyed either underground or aboveground to the raw material day bins. The raw material day bins will then feed into one or more of the four (4) SAFs. The SAFs will then convert the coal, woodchips, and quartz into 98% pure silicon metal in molten form. Each SAF will be rated at approximately 25 megawatts per hour of input and will produce a design maximum of 2.75 tons of silicon per hour. The processes associated with producing the silicon will include raw material handling and silicon metal melting and tapping. Each SAF will be equipped with a baghouse for controlling PM emissions. Appropriate equipment will be installed on each SAF that will be used to duct furnace exhaust gases to the baghouse. These four (4) SAFs are identified as emission unit AA-201 and will produce 98-99% pure silicon metal. The submerged arc process is a reduction smelting operation. In the production of silicon metal, quartz is the raw material from which silicon is derived. Carbon is necessary as a reducing agent and is supplied by coal and woodchips and limestone is used as flux. Smelting in the SAF is accomplished by conversion of electric energy to heat. An alternating current applied to the electrodes

causes a current to flow through the charge from the electrode tips to the furnace hearth. This provides a reaction zone of temperature up to 3600 degrees F. To maintain a uniform electric load, electrode depth is continuously varied automatically, as required. At high temperatures in the reaction zone, the carbon sources react chemically with silicon dioxide gas to form carbon monoxide and silicon metal. Molten product from the SAFs will then be tapped from the SAF through a taphole located at the bottom of the SAF at hearth level. The molten metal and dross will flow from the taphole into a ladle. The ladle will be moved by a hoist to the casting process. The metal will be poured into low, flat pans that will provide rapid cooling of the molten metal. Fume and dust generated and captured throughout the production process including tapping will be controlled by the baghouses and then collected and reused or sold. The process will also include four (4) natural gas-fired ladle pre-heaters rated at 10.0 MMBtu/hr each, which will be used to provide additional heat for further processing of the molten silicon to silicon flakes. The natural gas-fired ladle pre-heaters are identified as emission unit AA-202. Due to the nature of this operation, potential emissions of criteria air pollutants including carbon monoxide (CO), nitrogen oxide (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC), particulate matter (PM) and greenhouse gases (primarily in the form of carbon dioxide (CO_2) may occur from a) smelting in the SAF; b) combustion of natural gas in the ladle pre-heaters; and c) material ladling and casting operations. Fume and dust generated and captured throughout this manufacturing process including tapping will be controlled by the baghouses which vents to a single exhaust stack associated with each SAF. The collected dust from the meltshop baghouses will then be collected and reused or sold. Four (4) baghouses will be used to capture and control PM emissions generated from the four (4) SAF operations. Good work practices will also be employed to minimize the release of regulated air pollutants f All of the emissions associated with natural gas combustion in the ladle pre-heater are considered fugitive in natural and will not be routed to a control device or through a stack. Each of the four (4) SAFs is considered a point source and will be controlled by its own baghouse. Each baghouse will have a stack with the following parameters:

- Stack Height – Approximately 300 feet above grade;
- Stack Diameter - 15 feet in diameter;
- Stack flow rate of 125,000 acfm; and
- Exhaust stack gas temperature of approximately 140 degrees F.

Silicon product refinement and handling occurs after the casting operations. After the metal has been cooled it will be crushed and sized to customer specifications. Any remaining undersized material will be re-melted during the casting process. The following emission units have been identified in the product refinement and handling operation (AA-301):

- AA-301 –Silicon grinding and milling operations.

The following plantwide operations and activities will support the entire plant and will also have the potential to emit regulated air pollutants. No further detail will be given regarding these activities since this information can be found in the application and is general and not necessarily unique to Mississippi Silicon :

- Tank farm;
- Fugitive emissions from roadways;
- Slag handling;
- Silica fume silos:
- Facility-wide miscellaneous operations; and
- Emergency generator.

PSD Project Description

The proposed silicon manufacturing plant will be constructed in two (2) phases (The planned two phases are not greater than 18 months). After completion of both phases, the manufacturing plant will have constructed four (4) semi-enclosed submerged arc furnaces (SAF) with a capacity of 2.75 tons/hr each (~45 MVA) to produce approximately 84,096 tons/year of 98-99% pure silicon metal. The proposed project will have the potential to emit regulated air pollutants in sufficient quantities (i.e., tons/year) to trigger the PSD regulations. Potential emission of regulated air pollutants at the conclusion of Phase II are summarized below:

Table 1. PSD Applicability

Pollutant	Potential to Emit Emissions Rate (TPY)	Significant Emission Rate (TPY)	PSD Review Required? (Yes/No)
PM	104.1	25	Yes
PM_{10}	81.6	15[1]	Yes
$PM_{2.5}$	73.1	10	Yes
NO_X[1,2]	1,906.2	40	Yes
SO_2[1]	2,170.1	40	Yes
VOC[2]	93.5	40	Yes
CO	1,444.3	100	Yes
Greenhouse Gases (CO2e)	402,396.76		Yes
Lead	0.01	0.6	No

[1] As of April 28, 2011, both NO_x and SO_2 are precursors for $PM_{2.5}$. Therefore, if NO_x or SO_2 exceed 40 TPY, the project is considered major for $PM_{2.5}$.

[2] Both NO_x and VOC are considered precursors for ozone with a significant emission rate of 40 TPY each.

The MDEQ is proposing through the draft permit to limit the facility to operating two out of four SAFs at any given time in the PSD Construction Permit in order to meet the NAAQS. Since construction is phased and operation is also phased, the permittee will be able to utilize the operation data actuals emissions to show compliance with the NAAQS standards and possibly use this data for future modeling analysis for demonstrating the use of operating all four furnaces at the source. The source is aware that this future action, due to its limiting nature in the proposed PSD Construction, would require a significant modification to allow for the operation of all four furnaces.

In summary, the following equipment, technology, or good work practices will be employed to limit emissions from the proposed project and can be found implemented in the table of emission point limitations and monitoring and recordkeeping/reporting requirements:

- A negative pressure baghouse will be installed to control particulate matter on the plant's Submerged Arc Furnaces (SAF) to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions. One negative pressure baghouse will be installed for each individual SAF;
- A baghouse(s) will be installed to control particulate matter from raw material handling to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions;
- A baghouse(s) will be installed to control particulate matter from product handling to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions;
- Utilization of natural gas as the primary combustion fuel in the ladle pre-heaters associated with the proposed plant. This is the cleanest burning fossil fuel and inherently reduces emissions of regulated air pollutants when compared to other fossil fuels such as coal and oil;

- Implementation of a Fugitive Dust Control Plan to minimize potential emissions of $PM/PM_{10}/PM_{2.5}$ from becoming airborne from various support operations associated with the plant (i.e., slag handling, raw material handling, paved and unpaved roadways);
- Installation of low NO_x burner technology or design on the plant's natural gas combustion devices to reduce potential emission of oxides of nitrogen (NO_x);
- Inclusion of bin vent filters on silica fume silos to reduce potential $PM/PM_{10}/PM_{2.5}$ emissions;
- Energy efficiency techniques to reduce the plant's overall potential for formation of greenhouse gas emissions (GHG);
- Implementation of testing, monitoring, recordkeeping and reporting requirements to ensure the plant will operate in compliance with applicable regulatory requirements and will not cause or contribute significantly to an exceedance of air quality standards developed by EPA to protect human health and welfare.

III. Best Available Control Technology (BACT) Analysis

The BACT requirement is defined as:

> *"an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."*

BACT by definition is the most effective control option which is technically feasible considering economic, energy, and other environmental impacts. Control options can be eliminated as BACT on a basis of technical, economic, energy, or environmental considerations. The determination of BACT follows a Top-Down approach. In the top-down approach, progressively less stringent control technologies are analyzed until a level of control considered BACT is reached on the basis of environmental, energy and economic impacts. The key steps in the Top-Down process are as follows:

STEP 1: Identify Available Control Technologies: For the source, emissions unit, activity, or process requiring BACT, identify and list all "available" emissions control options for each pollutant. Available control options are those control technologies and techniques with a practical potential for application to the source, emissions unit, activity, or process. In general, any control option in commercial use in the United States at the time the analysis is performed should be included on the list of available control options.

STEP 2: Eliminate Technically Infeasible Options: Considering site-specific factors and constraints, remove from the list compiled in STEP 1 all technically infeasible control options. A control option can be considered as technically infeasible if technical difficulties such as physical, chemical, or engineering constraints would preclude the successful use of the control option in the particular application in question. For all control options eliminated, demonstration that a control option is technically infeasible should be clearly documented in the BACT Analysis and included with the BACT submittal.

STEP 3: Rank Remaining Control Technologies by Control Effectiveness: Rank and list all remaining control options in order of control effectiveness with the most effective control alternative at the top of the

list. As noted above, the control technologies to be evaluated and ranked will apply to those associated with controlling emissions from similar emission sources.

STEP 4: Energy, Environmental, and Economic Considerations: Using the "Top Down" procedure specified below, control options may be eliminated as BACT candidates on the basis of energy, environmental, and economic impacts of the option. Energy impacts include but are not limited to energy efficiency impacts, fuel cycle efficiency considerations, and fuel availability. Environmental impacts include but are not limited to ground water and water impacts, solid and hazardous waste impacts, and air quality impacts from increases in emissions of other air pollutants that result from implementing the control option. Economic impacts include the sum of up-front capital cost and annual operation and maintenance costs of implementing the control option.

A control option may be eliminated as a BACT candidate on grounds of significant energy, environmental, or economic impacts. Rationale for eliminating a control option should be well documented and included in the analysis. Economic impacts should be evaluated by comparing the cost effectiveness of the control option with generally acceptable cost effectiveness ranges for control of the particular pollutant in question.

STEP 5: Documentation: Include with the analysis all information, calculations, assumptions, and data used in making the BACT determination.

Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

A. Best Available Control Technology (BACT) Analysis - Emissions of Greenhouse Gases (GHG)

This evaluation follows the guidance developed by USEPA during 2010 under the Tailoring Rule. Under this rule, any project occurring after July 1, 2011 and having a net increase of equal to or greater than 75,000 tons/year of CO_2 on an equivalence basis triggers a BACT evaluation. As defined in USEPA's document entitled "PSD and Title V Permitting Guidance for Greenhouse Gases", dated March 2011, the BACT evaluation process is required to include five (5) steps. These steps are essentially those steps that make up the Top-Down evaluation process.

This BACT evaluation focused on the control technologies that have been demonstrated and commercially available for equipment associated with silicon production. Because of the importance of controlling GHG emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of GHG will be controlled to the levels specified. Technologies or concepts for controlling GHG emissions are and will continue to emerge on paper and on a trial basis. Since these technologies have not been proven to be reliable (i.e., demonstrated technologies), evaluation of these technologies are not being addressed in this BACT evaluation. MS Silicon is very reluctant to install a non-proven technology that may require significant on-site adjustments, while at the same time not meeting required GHG emission limits.

GHG Emission Sources Subject to Control Technology Evaluation

The following GHG emission sources are present at silicon manufacturing operations:

- Semi-Enclosed Submerged Arc Furnaces (AA-201);
- Natural Gas Combustion Equipment (AA-202); and
- Emergency Equipment (AA-501).

For a summary of the estimated GHG emission rates for the sources identified above, please refer to the following table.

GHG Emission Rates for Sources Evaluated for BACT

Equipment Description	GHG CO_2e Emission Rate (tons/year)
AA-201 - Semi-Enclosed Submerged Arc Furnaces (4 SAFs)	381,866
AA-202 - Natural Gas Combustion Equipment	20,499
AA-501 - Emergency Generator	32
TOTAL	402,397

BACT Analysis for GHG Emissions from Silicon Manufacturing

The production of ferroalloys results in emission of greenhouse gases. In ferroalloy production, raw ore, carbon materials and slag forming materials are mixed and heated to carbon sources. While CO_2 is the main greenhouse gas from ferroalloy production, recent research has shown that CH_4 and N_2O account for an equivalent greenhouse gas emission of up to 5 % of the CO_2 emissions from ferrosilicon (FeSi) and silicon-metal (Si-metal) production.

The most significant greenhouse gas (GHG) emissions are related to the generation of carbon dioxide during the chemical reactions occurring in the metallurgical furnaces, where carbon is used to reduce the quartz to silicon metal. The second source of CO_2 emissions in silicon metal production comes from the use of natural gas in combustion processes. **The use of emergency equipment is limited to 100 hours per year and generates an insignificant amount of GHG and thus will not be included in this BACT analysis.**

BACT Analysis for GHG Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step One - Identify Available GHG Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling GHG emissions from semi-enclosed submerged arc furnaces used in silicon production operations:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

Review of the above sources did not identify information on controlling GHG emissions from the semi-enclosed submerged arc furnaces used in silicon production processes. In electric arc furnaces, electrical resistance generates the heat required: the resistance in a SAF furnace is the atmosphere, while in a submerged-arc furnace the slag or charge forms the resistance. No control options for emissions from the SAF were identified in this review.

The possible control options that will be evaluated have been divided into two (2) distinct areas; 1) energy efficiency improvement options, and 2) add-on controls. The application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity. Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions. While energy efficiency can reduce emissions of all combustion-related emissions, it is a particularly important consideration for GHGs since the use of add-on controls to reduce GHG emissions is not as well advanced as it is for most combustion-derived pollutants.

Opportunities to further improve energy efficiency from electric arc furnaces in general are described below.

Control Measure	Description	Discussion
Improved Process Control	Process control can optimize operations and thereby significantly reduce electricity consumption. Control and monitoring systems for SAF are moving towards integration of real-time monitoring of process variables	This control measure is feasible and will be included in the SAF design.
Adjustable Speed Drives	As flue gas flow varies over time, adjustable speed drives offer opportunities to operate dust collection fans in a more energy efficient manner.	This control measure is feasible and will be included in the SAF design.
Transformer Efficiency—Ultra-High–Power Transformers	Ultra-high–power (UHP) transformers help to reduce energy loss and increase productivity. Location of the furnace transformers minimizing the length of the HV cables, less power losses.	This control measure is feasible and will be included in the SAF design.
Post-Combustion of the Flue Gases	Post-combustion is a process for utilizing the chemical energy in the CO and hydrogen evolving to heat the SAF ladle or to preheat other materials 570-1,470°F (300-800°C). It reduces electrical energy requirements and increases the	This control measure is not applicable to the silicon metal production process. There are no post combustion processes for silicon metal. This control measure will be excluded from

Control Measure	Description	Discussion
	productivity of the SAF.	further consideration in this BACT analysis.
Direct Current Arc Furnace	The direct current (DC) arc furnace was pioneered in Europe, and these single-electrode furnaces have recently been commercialized in North America. The DC arc furnaces use DC rather than alternating current (AC). In a DC furnace one single electrode is used, and the bottom of the vessel serves as the anode. However, compared to new AC furnaces, the savings are limited.	This technology is feasible but the technology has been only tested on an experimental scale with poor results. Direct current arc furnaces have never been performed on a large scale for silicon metal production. This control measure will be excluded from further consideration in this BACT analysis.
Engineered Refractories	Refractories in SAF have to withstand extreme conditions such as temperatures over 2,900°F (1,600°C), oxidation, thermal shock, erosion and corrosion. Refractories can be provided by a controlled microstructure: alumina particles and mullite microballoons coated uniformly with carbon and carbides.	This control measure is feasible and will be included in the SAF design.
Airtight Operation	A large amount of air enters the SAF: around 1,000,000 ft^3 (30,000 m^3) in a standard SAF. This air is at ambient temperature, and the air's nitrogen and non-reactive oxygen are heated in the furnace and exit losses. The potential benefit for an industrial furnace with an airtight process including a post combustion practice and an efficient fume exhaust control are about 100 kWh/ton for an industrial furnace having a current electric consumption of 450 kWh/ton.	The furnace is semi-closed. In order to charge the furnace with the raw materials and place them in the proper position, the furnace doors will need to be open in order to "push the raw materials" using the "stoking machine" into place. Doors will be closed when not needed.
Flue Gas Monitoring and Control	The use of VSDs can reduce energy usage of the flue gas fans, which in turn reduces the losses in the flue gas.	This control measure is feasible and will be included in the SAF design.
Bottom Tapping	Bottom tapping leads to slag-free tapping, shorter tap-to-tap times, reduced refractory and electrode	This control measure is feasible and will be included in the SAF design.

Control Measure	Description	Discussion
	consumption, and improved ladle life	
Carbon Capture and Storage	Carbon capture and storage involves separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 via pipeline, and finally injection and long-term geologic storage of the captured CO_2. Several different technologies, at varying stages of development, have the potential to separate and capture CO_2. Some have been demonstrated at the slip-stream or pilot-scale, while many others are still at the bench-top or laboratory stage of development	See below.

Step Two – Eliminate Technically Infeasible Control Options

All of the control options identified under Step 1 with the exception of Direct Current Arc Furnace, Post-Combustion of the Flue Gases, and Carbon Capture and Storage are technically feasible and were included in the BACT evaluation.

Carbon capture and sequestration (CCS) were not applied to SAFs in the past and has not been demonstrated in practice for these emission types. CCS is generally used for facilities with sources emitting CO_2 in large amounts, such as fossil fuel-fired power plants, and for industrial facilities with high-purity CO_2 streams.

CCS involves capturing CO_2, transporting it as necessary, and permanently storing it instead of releasing it into the atmosphere. The process involves three main steps:

- Capturing CO_2 at its source by separating it from other gases produced by an industrial process. Once CO_2 is separated and captured, it then can be compressed under high pressure for transport to an appropriate geological storage site;
- Transporting the captured CO_2 to a suitable storage location (typically in compressed form); and
- Storing the CO_2 away from the atmosphere for a long period of time, for instance in underground geological formations, in the deep ocean, or within certain mineral formations.

The process of transporting CO_2 is typically considered via pipeline and has substantial associated logistic hurdles and operational penalties. Transportation infrastructure issues include pipeline routing, acquisition of rights-of-way, and associated environmental impacts. In addition, additional energy must be expended to compress and transport the compressed CO_2. An alternative means of transporting the compressed CO_2 is via a ship, similar to transporting liquid natural gas. Again, there are similar logistic hurdles and operational penalties for transporting compressed CO_2 via ship that can be substantial.

Carbon sequestration usually involves the injection of CO_2 into deep geological formations of porous rock that are capped by one or more nonporous layers of rock. Injected at high pressure, the CO_2 exists as a

liquid that flows through the porous rock to fill the voids. Saline formations, exhausted oil and gas fields, and unmineable coal seams are candidates for CO_2 storage. Also, CO_2 injected for enhanced oil recovery projects can result in long-term sequestration depending on the geologic conditions. Other schemes include liquid storage in the ocean, solid storage by reactions leading to the creation of carbonates, and terrestrial sequestration. This type of infrastructure does not exist at the proposed plant site.

Another important technical consideration is that carbon capture is simpler when CO_2 is produced in high purity and high concentration streams as the byproduct of certain industrial processes, such as natural gas processing, hydrogen production, and synthetic fuel production. In contrast, it is relatively more difficult to capture CO_2 from flue gas emissions, which may require the reengineering of certain established and reliable production techniques. Apart from the technical issues of cleaning such dirty gas streams so they are suitable for CCS, unlike power plants, where CO_2 concentrations are comparatively high and consistent, metallurgical operations have more dilute concentrations of CO_2, the off gas is dirty and difficult to handle, and CO_2 production varies widely depending on the process step.

In summary, CCS is excluded from this BACT evaluation for the following reasons:

- Installation and operate of CCS is not commercially available and has not been installed in conjunction with any SAF process installed and currently operating worldwide;
- Currently there is no infrastructure available at the project site that will allow MS Silicon the ability to capture it's CO_2 gas streams and pipe them to a nearby facility for further processing, such as a beverage plant;
- Currently there is no infrastructure available at the project site that will MS Silicon the ability to capture and store it's CO_2 gas stream for future use in the event a beverage plant would be installed in the vicinity of the proposed plant site;
- CO_2 produced at the proposed plant will require significant enhancements to improve its quality prior to being used by another source to produce a product; and
- Cost estimates are not being provided in support of removing CCS as a cost effective control alternative since EPA has not provided any guidance or established thresholds on what cost, expressed as a dollar per ton would be considered cost excessive.

Because of the various reasons provided above, MS Silicon is eliminating CCS has a viable control option for GHG control based on its 1) not being commercially available and 2) not being shown to be a proven control option that has been demonstrated in actual operation.

Based on the above technical issues, CCS is consequently deemed not technically feasible for controlling GHG emissions from the proposed SAFs.

Step Three – Assessment of Proposed BACT Emission Reduction Options

This step of the Top-Down analysis provides an assessment of the performance and feasibility of the emission reduction options evaluated. MS Silicon is proposing to utilize the newest generation of submerged arc furnace with inherently lower-emitting technologies, including energy efficiency measures. This new generation furnace is designed to more efficiently convert raw materials to the silicon intermediate product. It is almost impossible to evaluate each option defined above and establish a CO_2 percent reduction.

For purposes of this GHG BACT evaluation, MS Silicon has concluded that the new generation furnace is the most effective control at reducing GHG emissions.

Step - Four Evaluate Most Effective Control and Document Results

As discussed above, various emission reduction options (i.e., new generation furnace) are being proposed by MS Silicon that are considered the **Top Level** of emission reduction available for controlling GHG emissions from the production of silicon. Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

Step Five – Select BACT

A detailed review was conducted to determine the emission reduction options incorporated at other submerged arc furnaces. Review of recently permitted GHG sources and the RBLC database did not reveal BACT determinations for submerged arc furnaces.

BACT for GHG emissions from the semi-enclosed submerged arc furnace has been determined to be:

- **Utilization of a new generation furnace with inherently lower-emitting technologies and energy efficiency measures (i.e., semi-enclosed SAF);**
- **CO_2e emission limitation of 381,866 tons/year; and**
- **Good operation and maintenance to improve energy efficiency.**

A BACT Analysis for GHG Emissions from Natural Gas Combustion (AA-202)

The following natural gas combustion emission sources are included in this review:

Description	Heat Input (MMBTU/hr)	Heat Input (MMscf/year)	Total GHG Emissions (CO_2e) (tons/year)
Natural Gas fired Ladle Pre-Heaters – 4 Units – 10.0 MMBtu/hr each	40.0	350,00	20,499

Step One – Identify Available GHG Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling GHG emissions from natural gas combustion equipment:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

The application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity from combustion sources. Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions. Since GHG are the direct result of fuel combustion, any improvement in the efficiency of a process heater will reduce fuel use and GHG emissions. While energy efficiency can reduce emissions of all combustion-related emissions, it is a particularly important consideration for GHGs since the use of add-on controls to reduce GHG emissions is not as well advanced as it is for most combustion-derived pollutants.

Approaches for reducing GHG emissions from fossil fuel-fired equipment could include fuel switching or energy efficiency measures. In the case of natural gas-fired equipment, however, fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels commonly used.

Summary of Potentially Applicable GHG Energy Efficiency Measures – Natural Gas Combustion Sources

Control	Removal Effectiveness	Comments
Burner replacement	Replacing old burners with more efficient modern burners can lead to significant energy savings. Energy and cost savings vary widely based on the condition and efficiency of the burners being replaced.	• Energy efficient burners will be installed in the natural gas combustion equipment
Boiler process control	Using a combination of CO and oxygen readings, it is possible to optimize the fuel/air mixture for high flame temperature (and thus the best energy efficiency) and lower air pollutant emissions	• Natural gas combustion equipment will optimize the fuel/air mixture for high flame temperature
Reduction of flue gas quantities	Excessive flue gas results from leaks in the boiler and/or in the flue. These leaks can reduce the heat transferred to the steam and increase pumping requirements. However, such leaks are often easily repaired, saving 2 to 5 percent of the energy formerly used by the boiler	• Equipment will be maintained to minimize any leaks

Control	Removal Effectiveness	Comments
Reduction of excess air	Boilers must be fired with excess air to ensure complete combustion and to reduce the presence of CO in the unburned fuel in exhaust gases. When too much excess air is used to burn fuel, energy is wasted because excessive heat is transferred to the air rather than to the steam.	• Equipment will be maintained to ensure complete combustion
Carbon Capture and Storage	Carbon capture and storage involves separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 via pipeline, and finally injection and long-term geologic storage of the captured CO_2. Several different technologies, at varying stages of development, have the potential to separate and capture CO_2. Some have been demonstrated at the slip-stream or pilot-scale, while many others are still at the bench-top or laboratory stage of development	See below.

Step Two – Eliminate Technically Infeasible Control Options

With the exception of carbon capture and sequestration (CCS), all of the control options identified under Step 1 are technically feasible and will be included in this BACT evaluation. CCS was not evaluated in this BACT evaluation. This type of control technology has not been applied to natural gas combustion sources in the past and has not been demonstrated in practice for these emission types. CCS is generally used for facilities with sources emitting CO_2 in large amounts, such as fossil fuel-fired power plants, and for industrial facilities with high-purity CO_2 streams. Based on this, CCS is consequently deemed not technically feasible for controlling the GHG emissions from the natural gas combustion sources that will support the proposed plant operations.

Thus, the available control options are as follows:

- Combustion of clean-burning fuel - Burners are designed to combust natural gas. Fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels commonly used;
- Energy efficiency pollution prevention options that are available for this type of combustion device include the following:
    - Burner efficiency;
    - Preventive Maintenance; and

- Energy monitoring and management systems.

Step Three – Assessment of Proposed BACT Emission Reduction Options

This step of the Top-Down analysis provides an assessment of the performance and feasibility of the emission reduction options evaluated. Combustion of natural gas, low NO_x burners and good combustion practices and maintenance to improve energy efficiency are considered the top level of emission reduction available for the natural gas combustion equipment.

Step Four - Evaluate Most Effective Control and Document Results

The emission reduction options that are being proposed by MS Silicon that are considered the **Top Level** of emission reduction available for controlling GHG emissions from the combustion of natural gas. Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

Step Five - Select BACT

A detailed review was conducted to determine the emission reduction options incorporated at other natural gas fired burners. Review of the RACT/BACT/LAER Clearinghouse (RBLC) revealed the following BACT determinations for natural gas combustion equipment.

Facility/ RBLC ID	Permit Date	Basis	Process	GHG BACT Limit	Controls
Cargill, Inc. NE-0054 DRAFT DETERMINATION	3/1/13	BACT-PSD	300 MMBtu/hr Boiler	No Limit	Good combustion practice
Iowa Fertilizer Company IA-0105	10/26/12	BACT-PSD	472.4 MMBtu/hr Auxiliary Boiler	CO_2:117 lb/MMBtu Methane:0.0023 lb/MMBtu N_2O: 0.0006 lb/MMBtu	Good combustion practice
Iowa Fertilizer Company IA-0105	10/26/12	BACT-PSD	110.12 MMBtu/hr Startup Heater	CO_2:117 lb/MMBtu Methane:0.0023 lb/MMBtu N_2O: 0.0006 lb/MMBtu	Good combustion practice

Facility/ RBLC ID	Permit Date	Basis	Process	GHG BACT Limit	Controls
Showa Denko Carbon, Inc. SC-0142	6/8/12	BACT-PSD	5 MMBtu natural gas fired hot oil heater	CO_2e: 3093 tpy	Good combustion practice, annual tune-up low NO_x burner
Port Dolphin Energy LLC FL-0330	12/1/11	BACT-PSD	Four 278 MMBtu/hr boilers	CO_2:117 lb/MMBtu	tuning, optimization, instrumentation and controls, insulation, and turbulent flow
Pyramax Ceramics, LLC GA-0147	2/8/12	BACT-PSD	9.8 MMBtu/hr natural gas fired boiler	CO_2e: 5809 tpy rolling average	Good Combustion Practices, design, and thermal insulation
Entergy Louisiana LLC, Nine Mile Point Electric Generating Plant LA-0254	08/16/11	BACT-PSD	Auxiliary Boiler 338 MMBtu/hr	CO_2:117 lb/MMBtu Methane:0.0022 lb/MMBtu N_2O: 0.0002 lb/MMBtu	Proper operation and good combustion practices

Summary of Potentially Applicable GHG Energy Efficiency Measures – Natural Gas Combustion Equipment

Control	Description	Comments
Use of Low Carbon Fuels	Burners will be combusting natural gas	• Burners are designed to combust natural gas. Fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels

Control	Description	Comments
Energy efficient processes and technologies	• Low NOx burners, • Good combustion practices to improve energy efficiency • Good maintenance of combustion equipment	• Burner design will incorporate low NOx burners and good combustion practices and maintenance to improve energy efficiency

Based on information reviewed for this BACT analysis, the GHG control measures focus on fuel type or energy efficiency measures. No other applicable GHG control measures were identified in this review. Provided below is a summary of the emission reduction options being incorporated into the natural gas fired combustion devices associated with the proposed silicon plant. Rationale for selection of BACT includes the use of natural gas as a clean burning fuel, use of low NO_x energy efficient burner technology and good combustion practice.

BACT for this emission unit is as follows:

- CO_2 – 117 lb/MMBtu
- Methane – 0.0022 lb/MMBtu
- N_2O – 0.0002 lb/MMBtu

Control techniques to be implemented to meet these emission limitations will be: 1) good combustion practices, 2) combustion of natural gas only, 3) selection of the most energy efficient burner design based on engineering selection process and 4) periodic maintenance.

Best Available Control Technology (BACT) Analysis - Emissions of $PM_{10}/PM_{2.5}$

Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. Particulate matter exists in the solid and liquid physical states, and gases or vapors may also condense to form particulate matter. The latter, condensable particulate matter, is of great concern due to the inherently small size of condensation products; overwhelmingly, condensable particulate can be classified as $PM_{2.5}$[1]. $PM_{2.5}$ is defined as particulate matter that has a diameter of 2.5 microns or less and is a subset of PM_{10} which is particulate with a size range of 10 microns or less. Even though both are particulate matter they have separate air quality standards and are considered separate pollutants for permitting purposes. The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:

- "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.[2]

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for the proposed silicon production plant. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of $PM_{10}/PM_{2.5}$ will be controlled to the levels specified. Condensable $PM_{2.5}$ emissions occur when gas molecules are present in the exhaust gas stream that when cooled change into a particulate state. This change from gas vapor to solid is referred to as condensable particulates. USEPA is involved in extensive research on trying to better define this change over, as well as how best to quantify the presence of these condensable particulates. For purposes of this evaluation, since no specific technologies exist (i.e., commercially available and demonstrated), above and beyond that already selected in the form of a baghouse, for controlling $PM_{2.5}$ emissions, additional emphasize was placed on the availability of controls to reduce emissions of SO_2 and NO_x. Emissions of SO_2 and NO_x can be present in the gas phase that could convert to solids in the form of sulfates and nitrates. USEPA has identified SO_2 and NO_x as potential precursors to the formation of $PM_{2.5}$ emissions. However, USEPA has not provided, as of the date of this application, guidance on the effect of SO_2 and NO_x as potential precursors to the formation of $PM_{2.5}$ emissions. Subsequently, evaluation of the control options to reduce SO_2 and NO_x emissions to further reduce $PM_{2.5}$ emissions have not been included in this BACT evaluation.

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[1] Condensable Particulate Matter, Regulatory History and Proposed Policy, January 27, 1998 http://www.ncair.org/enf/sourcetest/cpm/condensweb.pdf

[2] http://www.epa.gov/air/particlepollution/

$PM_{10}/PM_{2.5}$ Emission Sources Subject to Control Technology Evaluation

The $PM_{10}/PM_{2.5}$ emission sources associated with the proposed plant that are included in this $PM_{10}/PM_{2.5}$ BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces (SAFs) (AA-201);
- Casting Frames (AA-201a);
- Silica Fume Silos (AA-404);
- Natural Gas Fired Combustion Equipment (AA-202);
- Diesel Fired Emergency Generator (AA-501);
- Material storage and handling (AA-101, AA-101a, AA-102, AA-102a, AA-103, AA-103a, AA-104, AA-105, AA-106);
- Wood Chipper (AA-102b); and
- Roadways (AA-401, AA-402a).

For a summary of the estimated $PM_{10}/PM_{2.5}$ emission rates for the sources identified above, please refer to the following table:

$PM_{10}/PM_{2.5}$Emission Rates for Sources Evaluated for BACT

Equipment Description	PM_{10} Emission Rate (tons/year)	$PM_{2.5}$ Emission Rate (tons/year)
AA-201 - Semi-Enclosed Submerged Arc Furnaces (SAFs)	61.2	61.2
AA-201a- Casting Frames	0.3	0.3
AA-202 - Natural Gas Fired Ladle Preheaters	0.1	0.1
Diesel Fired Emergency Generator (AA-501)	0.001	0.001
Material Handling and Storage:		
• Material Transfer to and from Coal Storage Pile (AA-101)	0.01	0.002
• Material Transfer to and from Wood Storage Pile (AA-102)	0.002	0.0003
• Material Transfer to and from Quartz Storage Pile (AA-103)	1.8	0.3

Equipment Description	PM_{10} Emission Rate (tons/year)	$PM_{2.5}$ Emission Rate (tons/year)
• Limestone Material Handling (AA-104)	0.0008	0.0001
• Material Handling Area Baghouse (AA-101a, AA-102a, AA-103a)	6.8	6.8
• Product Handling Area Baghouse (AA-301)	3.4	3.4
• Storage Piles Processing (i.e., Bulldozing) (AA-105)	1.7	0.2
• Storage Piles Wind Erosion (AA-106, AA-403)	2.5	0.4
• Silica Fume Silos (AA-404)	0.15	0.15
AA-102b - Wood Chipper	0.042	0.042
AA-402 - In-Plant Gravel Roads	3.7	0.37
AA-402a - In-Plant Paved Roads	0.3	0.3
Total	**81.8**	**73.3**

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Semi-Enclosed Submerged Arc Furnaces

Step One - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling $PM_{10}/PM_{2.5}$ emissions from plant operations:

1. On-line USEPA Control Technology Database; and
2. State Air Quality Permits;

Particulate control technologies exist today that are proven and reliable that that provide a high level of removal efficiency (i.e., in excess of 99%). These technologies are well suited for controlling particulate matter, including $PM_{2.5}$ in the form of solids or "filterable" particulates. As will be described in the BACT evaluation that follows, MS Silicon is installing a fabric filter bag-house which is considered the top level

of $PM_{10}/PM_{2.5}$ control technology for filterable particulates from the semi-enclosed submerged arc furnace. MS Silicon will also be using Best Management Practices to minimize the generation of $PM_{10}/PM_{2.5}$ fugitive emissions.

Technologies will continue to emerge for controlling particulate matter emissions, including $PM_{2.5}$ that are in the vapor phase in the exhaust gas and when cooled by ambient air at the point of the exhaust stack release, change from a vapor phase to a solid phase. This change over is defined as "condensable" particulates. As part of the BACT evaluation that follows we have examined proven technologies that can further reduce these precursors, thus reducing the condensable portion of $PM_{2.5}$ from the exhaust gas stream. Condensable $PM_{2.5}$ emissions should be minimal from the fugitive sources.

The choice of which technology is most appropriate for a specific application depends upon several factors, including particle size to be collected, particle loading, stack gas flow rate, stack gas physical characteristics (e.g., temperature, moisture content, presence of reactive materials), and desired collection efficiency. Emissions of particulate matter are generally controlled with add-on control equipment designed to capture the emissions prior to the time they are exhausted to the atmosphere. In cases where the material being emitted is organic, particulate matter may be controlled through a combustion process. The following control technologies were identified and evaluated to control $PM_{10}/PM_{2.5}$ emissions from the SAF:

(a) Electrostatic Precipitator (ESP) - In an ESP, particles are electrically charged and then exposed to an electric field in which they are attracted to an electrode. Periodically, this electrode is cleaned through vibration and the freed particles are directed into a collection unit. While ESPs have been used on solid fuel combustion devices they have not been used on similar sources as the proposed plant

(b) High Efficiency Cyclones - Cyclones and multicyclones are a commonly used PM control technology in the United States. A cyclone removes particles based the principle of gravity and centrifugal force. A multicyclone uses the same concept as a cyclone but employs multiple, smaller diameter cyclones to improve its capturing capacity. The particle control efficiency of both devices decreases as the particle size decreases and therefore do not adequately control $PM_{2.5}$.

(c) High Energy Scrubbers – High energy scrubbers are a wet scrubbing system that combines a high energy venturi scrubber with a cyclonic separator. These scrubbers are effective in the removal of dusts, fumes, vapors, and mists; as well as a variety of other air pollutants, and

(d) Fabric Filters (i.e., baghouses) - Fabric filters have been widely used for controlling PM emissions from many different types of sources. Large industrial, commercial, and Institutional (ICI) boilers are equipped with these devices and have PM control efficiencies of 99 percent or higher. A fabric filter, or baghouse, is made up of cloth or woven specialty fibers. The flue gases are directed through the filter. The separation efficiency of bag filters is quite high. Because of their design (large surface area of bags and longer residence times in transit), fabric filters may capture a higher fraction of ultrafine particles than ESPs

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull air from the SAF and push the dust laden air through the fabric filters and into the ambient air via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from SAF operations application due to their effectiveness. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to electric arc furnaces at silicon production plants:

Facility/	Permit Date	Process	PM_{10} Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	PM: 21.3 lb/hr per furnace (based on process weight rate calculation	Fabric filter (baghouse)
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	0.99 lb/MW-hr 6.2 lb/hr	Baghouse
West Virginia Alloy, Inc. Alloy, West Virginia R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	PM10: 22.71 lb/hr	Baghouse with >99% control
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	0.03 gr/dscf (filterable) or no visible particulate emissions, whichever is less stringent	Open roof Baghouse

As shown in the above table, PM emissions from submerged electric arc furnaces are controlled exclusively by baghouses and the BACT emission limits vary in how they are expressed. Because of the variations in the plant operations, it is very difficult to identify a consistent BACT emission limitation or permit limitation. For the $PM_{10}/PM_{2.5}$ emission sources associated with the SAFs at the proposed plant, a

baghouse was the only control methods evaluated. The proposed BACT limit is at least as stringent as the permit limits presented in the table above.

Thus, BACT for $PM_{10}/PM_{2.5}$ emissions from the semi-enclosed submerged arc furnaces at the proposed plant is as follows:

- **Use of fabric filter control (i.e., baghouse); and**
- **$PM_{10}/PM_{2.5}$ – 0.005 grains per dry standard cubic foot (gr/dscf).**

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Casting Frames (AA-201a)

Molten product from the SAFs will be poured into low, flat pans that will provide rapid cooling and solidification of the molten metal. There is a potential for fume and dust to be generated during the casting process, however the amount of actual dust should be minimal.

Step One - Identify Available $PM/PM_{10}/PM_{2.5}$ Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. Potential PM control technologies are identified in the previous section.

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM/PM_{10}/PM_{2.5}$ emissions from the casting operations. The exhausting of casting emissions from a central canopy positioned over the casting installations to the SAF baghouse is neither practical nor economically feasible since it is too far away. In addition, the casting frame emissions in question are very low (< 1.0 tons/year) and can also be further minimized by the manner with which the unit is operated. The potential PM emissions are small and installation of a canopy and exhaust dust system is not very effective at capturing these small quantities of PM emissions. Thus, add-on controls are eliminated from further consideration in this BACT evaluation.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control option is best management practices.

Step 4 – Evaluate the Most Effective Controls and Document Results

Best management practices are the only effective control for this type of emission source.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for casting operations associated with the silicon production operations. Review of state permit information also did not identify BACT determinations for casting operations associated with the silicon production operations.

MS Silicon will be using Best Management Practices to minimize the generation of $PM/PM_{10}/PM_{2.5}$ fugitive emissions from the casting frame operation.

BACT for $PM/PM_{10}/PM_{2.5}$ for the casting frames (AA-201a) is proposed as:

- Best Management Practices to minimize the generation of $PM/PM_{10}/PM_{2.5}$ fugitive emissions from the casting frame operation; and

- No emission limit is being proposed since there is no formal method for quantifying emissions from this type of indoor operation.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Natural Gas Combustion (AA-202)

Because natural gas is a gaseous fuel, filterable PM emissions from combustion are typically low. Particulate matter from natural gas combustion has been estimated to be less than 1 micrometer in size and has filterable and condensable fractions. Particulate matter from natural gas combustion is usually larger molecular weight hydrocarbons that are not fully combusted. Increased PM emissions may result from poor air/fuel mixing or maintenance problems[3].

Natural Gas Combustion Sources – Includes the following:

- AA-202: Ladle Pre-Heaters (Four 10 MMBtu/hr): 0.1 tpy $PM_{10}/PM_{2.5}$;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from small natural gas combustion units. See below table for summary of $PM_{10}/PM_{2.5}$ BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	PM_{10} BACT Limit	$PM_{2.5}$ BACT Limit	Add-On Controls
SeverCorr LLC Columbus, Mississippi	07/15/11	BACT-PSD	Ladle preheaters, ladle dry-out heaters, Tundish preheaters, Tundish dry-out heaters, vertical ladle holding station, annealing furnaces, vacuum degasser boiler, boilers	None	None	Combustion of natural gas only
Nucor Steel, AR Blytheville, AR	06/10/11	BACT-PSD	Pickle Line Boilers, natural gas fired burners and dryers, ladle dryers	0.0076 lb/MMBtu	None	None

[3] AP 42, Fifth Edition, Volume I, Chapter 1.4: External Combustion Sources Natural Gas Combustion, July 1998

Facility/ RBLC ID	Permit Date	Basis	Process	PM_{10} BACT Limit	$PM_{2.5}$ BACT Limit	Add-On Controls
Sasol North America LA-0244	11/29/10	BACT-PSD	87.30 MMBtu/hr charge Heater	Total PM_{10}: 0.01 lb/MMBtu	-	No controls
Sasol North America LA-0244	11/29/10	BACT-PSD	21.00 MMBtu/hr startup Heater	Total PM_{10}: 0.01 lb/MMBtu	-	No controls
Lake Charles Cogeneration LLC LA-0231	06/22/09	BACT-PSD	34.20 MMBtu/hr Shift Reactor Startup Heater	Total PM_{10}: 0.007 lb/MMBtu	-	Good design and proper operations
Competitive Power Ventures MD-0040	11/12/08	BACT-PSD	1.70 MMBtu/hr Heater	Filterable PM_{10}: 0.0070 lb/MMBtu	Filterable 0.0070 lb/MMBtu (LAER)	No controls
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	Ladle Preheater and refractory drying	0.0076 lb/MMBtu (total)	-	Combustion of natural gas
Thysenkrupp Steel and Stainless USA, LLC AL-0230	08/17/07	BACT PSD	33.40 MMBtu/hr Batch Annealing Furnaces	0.0076 lb/MMBtu	-	No controls
Nucor Decatur, LLC AL-0231	06/12/07	BACT-PSD	98.7 MMBtu/hr Galvanizing Furnace	PM: 0.0076 lb/MMBtu	-	No control
Republic Engineered Products, Inc OH-0303	08/30/05	LAER	Ladle Dryers/Preheaters	7.6 lb/mmscf (filterable)	7.6 lb/mmscf (filterable)	Good combustion control with proper natural gas burner design, no add-on controls
6Nucor Steel IN-0090	01/19/01	BACT-PSD	Ladle Preheaters	-	-	Combustion of natural gas or propane
Arkansas Steel Associates AR-0044	01/05/01	BACT-PSD	Ladle Preheaters	0.20 lb/hr (filterable)	-	Natural gas combustion/ Good combustion practices

As shown in the above table, no add-on controls are used for $PM_{10}/PM_{2.5}$ from the natural gas combustion equipment.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling PM emissions. No similar sized natural gas combustion devices were identified add-on PM controls as BACT.

Thus, BACT is defined as combustion of clean fuel and good combustion practices. For the natural gas combustion sources associated with the proposed Plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of PM control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

BACT for the natural gas combustion devices is as follows:

- **Combustion of natural gas; and**
- **Good operating practices.**

BACT Analysis for $PM_{10}/PM_{2.5}$ from Material Storage and Handling (AA-101, AA-101a, AA-102, AA-102a, AA-103, AA-103a, AA-104, AA-301)

Raw materials will be received by truck at the site. The primary materials to be handled and stored at the silicon production plant are as follows:

- Coal;
- Wood;
- Limestone and
- Quartz.

Upon receipt the raw materials will be unloaded, conveyed and stored in outside piles. The raw materials will then be transferred via front end loaders to day bins in the submerged arc furnace building.

Add on control devices such as a baghouse or wet suppression will minimize particulate emission rates from material storage and handling. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Baghouses typically achieve PM control efficiencies of greater than 99%.

Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50-70%.

AA-101: Material Transfer to and from Coal Storage Pile

Coal will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of coal.

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Review of the RBLC database and recent permit applications indicated that viable PM controls for coal transfer to and from storage piles is a fugitive dust control plan (windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions as required). Refer to table below for a listing of recent BACT determinations for coal receiving and handling operations.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.

- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.

- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The table below lists the proposed particulate BACT determination, along with the existing particulate BACT determinations, for coal receiving and handling and coal transferring. All data in the table is based on the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

The limits being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for coal handling operations at these facilities.

Existing PM/PM_{10}/$PM_{2.5}$ BACT Limits - Material Transfer to and from Coal Storage Pile

Facility	Date	Basis	Source	PM_{10}/$PM_{2.5}$ BACT Limit	BACT Control Method
East Kentucky Power Cooperative KY-0100	4/9/10	BACT-PSD	Coal Stockpile and unloading	PM: 10% opacity 3-minute	Wet suppression, dust suppressant, lowering well and compaction
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Coal storage piles	PM_{10}: 12.3 tpy rolling 12-month period	3-Sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
Martin Marietta Magnesia Specialties OH-0321	11/13/08	BACT-PSD	Coal and coke material handling	PM_{10}: 0.95 tpy rolling 12-month period	Building enclosure and high moisture content coal and coke >5%
Homeland Energy Solutions, LLC IA-0089	08/28/07	BACT-PSD	Coal receiving and handling	Filterable PM_{10}: 0.005 gr/dscf	Use of baghouse and water fogging. (Baghouse used to control storage bins and water fogging used to eliminate PM in unloading area
University of Northern Iowa IA-0086	5/3/07	BACT-PSD	Coal pile receiving and reclaim	Filterable PM_{10}: 095% control	Dust suppressant

Step 5 - Select BACT

BACT for the Material Transfer to and from Coal Storage Pile (AA-101) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;

- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate

Material Transfer to and from – Wood Storage Pile (AA-102)

Wood will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of this material. Since these operations will have the potential to emit minor levels (due to the inherent moisture content of the wood to be handled and stored) of $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of a fugitive type release, typical PM control technologies are not appropriate for these types of operations. The types of control measures used for materials handling operations can be classified as best management practices and include inherent pollution control techniques (covered conveyors, partially enclosed conveyor drop points, minimization of pile drop discharge distance, etc.).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Review of the RBLC database and recent permit applications indicated that viable PM controls for wood transfer to and from storage piles is a fugitive dust control plan (windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions as required). Refer to table below for a listing of recent BACT determinations for wood receiving and handling operations.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.

- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.
- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The table below lists the proposed particulate BACT determination, along with the existing particulate BACT determinations, for wood pile receiving, handling, and transferring. All data in the table is based on the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

The limits being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for wood handling operations at these facilities.

Existing $PM/PM_{10}/PM_{2.5}$ BACT Limits – Wood Storage and Handling

Facility	Date	Basis	Source	$PM_{10}/PM_{2.5}$ BACT Limit	BACT Control Method
Southeast Regional Fuels, LLC FL-0322	12/23/10	BACT-PSD	Biomass material handling and preparation	5% opacity	To minimize fugitive, PM_{10} and $PM_{2.5}$, biomass conveyors shall be enclosed. Where required to meet the 5 % opacity requirement, the permittee shall install dust collectors on the conveyor transfer and drop points. The dust collectors shall be designed to obtain an outlet PM loading of 0.005 grains per dry standard cubic foot (gr/dscf). Additional practices: Enclosing material drop points, transfer points, shredders and screens wherever practical; Contouring storage piles to minimize wind erosion; Utilizing water sprays on storage piles as needed;
Georgia Power Co. GA-0140	12/03/10	BACT-PSD	Biomass storage and handling	-	Partial enclosures for the conveyors; Partial enclosures for the transfer points

Facility	Date	Basis	Source	$PM_{10}/PM_{2.5}$ BACT Limit	BACT Control Method
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Biomass Storage Piles	AP-42 Calculation: 1.0 tpy fugitive PM_{10} No visible emissions except for 13-min in any 60-min period	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
Weyerhauser Co. LA-0201	05/24/06	BACT-PSD	Chip Handling	Filterable PM_{10} 0.0001 lb/T	Covered conveyors
Kingsford Manufacturing Company MS-0081	09/09/05	BACT-PSD	Wood Receipt	Filterable PM_{10}: 0.0020 lb/T wood	Good work practice standards and partial enclosure of truck dump area
			Wood Storage	Filterable PM_{10}: 0.0065 lb/T wood	Good work practice standards

The above table presents BACT limits for $PM_{10}/PM_{2.5}$ emissions from wood/biomass material handling operations. The limit being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for other material handling operations at other types of facilities.

Review of state permits for similar operations (i.e., ferroalloy operations) revealed the following:

Facility/	Process	PM_{10} BACT Limit	Add-On Controls

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009 Date: 11/26/10	Raw Material Handling - Raw Material Transfer and Storage operations begin with the receipt of raw materials via truck or rail. Coal, coke, charcoal, gravel, woodchips, and turnings are unloaded via crane to piles or directly to a below grade conveyor or pit. Coal is transferred to the pit, from which it is conveyed up to enclosed raw material storage bins or unloaded to outdoor storage piles. Gravel is unloaded to piles, transported by crane to a conveyor, screened, and conveyed up to enclosed storage bins. Wood chips are dumped from a trailer to the pit and transported up to enclosed storage bins. From indoor bins, the raw materials are weighed and dropped to a skip bucket from which they are transferred to the top of the furnace.	No limit	Enclosed storage bins
Globe Metallurgical Selma, AL 104-0001 Date: 9/10/10	Product Handling – Raw material receiving, transfer and storage	Process weight rate limitation 20% opacity in one 6-minute average in any 60 minute period	No add-on controls
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006 Date: 01/18/06	Raw material storage piles	No limit	None

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105 Date: 10/24/01	Raw material unloading and handling	20% opacity as a 3-minute average	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust
	Raw Material and Waste Storage Piles – Load in or load out, wind erosion	No visible particulate emissions except for 13 minutes during any 60-minute period	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust

Step 5 -Select BACT

BACT for the wood material handling operations (AA-102) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate

Material Transfer to and from Quartz/Limestone Storage Piles (AA-103, AA-104)

Quartz and limestone will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of these materials. Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of a fugitive type release, typical PM control technologies are not appropriate for these types of operations. The types of control measures used for materials handling operations can be classified as best management practices and include

inherent pollution control techniques (covered conveyors, partially enclosed conveyor drop points, minimization of pile drop discharge distance, etc.).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.
- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.
- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

Review of the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC) did not identify quartz handling and storage operations.

Review of state permits for similar operations (i.e., ferroalloy operations) revealed the following:

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009 Date: 11/26/10	Raw Material Handling - Raw Material Transfer and Storage operations begin with the receipt of raw materials via truck or rail. Coal, coke, charcoal, gravel, woodchips, and turnings are unloaded via crane to piles or directly to a below grade conveyor or pit. Coal is transferred to the pit, from which it is conveyed up to enclosed raw material storage bins or unloaded to outdoor storage piles. Gravel is unloaded to piles, transported by crane to a conveyor, screened, and conveyed up to enclosed storage bins. Wood chips are dumped from a trailer to the pit and transported up to enclosed storage bins. From indoor bins, the raw materials are weighed and dropped to a skip bucket from which they are transferred to the top of the furnace.	No limit	Enclosed storage bins
Globe Metallurgical Selma, AL 104-0001 Date: 9/10/10	Product Handling – Raw material receiving, transfer and storage	Process weight rate limitation 20% opacity in one 6-minute average in any 60 minute period	No add-on controls
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006 Date: 01/18/06	Raw material storage piles	No limit	None

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105 Date: 10/24/01	Raw material unloading and handling	20% opacity as a 3-minute average	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust
	Raw Material and Waste Storage Piles – Load in or load out, wind erosion	No visible particulate emissions except for 13 minutes during any 60-minute period	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust

The limit being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for other material handling operations at other types of facilities.

Step 5 -Select BACT

BACT for the quartz and limestone storage pile handling operations (AA-103, AA-104) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for these operations since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

Material Handling (Coal, Wood, Quartz) Baghouse (AA-101a, AA-102a, AA-103a) and Product Handling Area Baghouse (AA-301 and AA-403)

Material from the storage piles will be conveyed via front end loaders to enclosed day bins. From the day bins, the raw materials will be weighed and dropped to a skip bucket from which they will be transferred to the top of one (1) of four (4) semi-enclosed submerged arc furnaces for processing.

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of point source release, these emission can be controlled using the particulate matter controls described in previous sections of this document.

Step 2 - Elimination of Technically Infeasible $PM_{10}/PM_{2.5}$ Control Alternatives

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull air from the SAF and push the dust laden air through the fabric filters and into the ambient air via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from material handling operations due to their effectiveness. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 -Select BACT

BACT for the raw material and product handling operations (AA-101a, AA-102a, AA-103a, AA-301, AA-403) is proposed as the following:

- Baghouse for PM control; and
- A $PM_{10}/PM_{2.5}$ limitation of 0.003 gr/dscf.

It should be noted that MS Silicon is voluntarily designing the baghouse to meet 0.0015 gr/dscf to minimize the potential impact on $PM_{10}/PM_{2.5}$ air quality. This emission rate does not constitute BACT.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Silica Fume Silos (AA-404)

Silica fumes collected in the SAF baghouses will be pneumatically transferred to the silica fume silos. In the silos, the silica fumes will be densified to about 45 lbs/cu.ft., prior to dispatch to cement and refractory manufacturers that can use this dust in their other operations (i.e., cement and refractory).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of point source release, these emission can be controlled using the particulate matter controls described in previous sections of this document.

Step 2 - Elimination of Technically Infeasible $PM_{10}/PM_{2.5}$ Control Alternatives

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull air from the SAF and push the dust laden air through the fabric filters and into the ambient air via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from these operations. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 -Select BACT

BACT for the silica fume silos (AA-404) is proposed as the following:

- Bin vent filter for PM control; and
- A $PM_{10}/PM_{2.5}$ limitation of 0.01 gr/dscf.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Emergency Equipment (AA-501)

The emergency equipment includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP): 0.001 tpy $PM_{10}/PM_{2.5}$.

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from emergency generators. See below table for summary of PM BACT determinations from the RBLC database.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

The emergency diesel fired generator associated with the proposed project will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. The projected annual $PM_{10}/PM_{2.5}$ emissions rate is 0.001 tpy. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of $PM_{10}/PM_{2.5}$ emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control $PM_{10}/PM_{2.5}$ emissions from the emergency equipment, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing $PM_{10}/PM_{2.5}$ BACT determinations for diesel fired emergency equipment. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	$PM_{10}/PM_{2.5}$ BACT Limit	Add-On Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	Total PM: 0.2 g/KW-H	No controls The emergency generators shall comply with the emission limit and demonstrate compliance in accordance with the

Facility/ RBLC ID	Permit Date	Process	$PM_{10}/PM_{2.5}$ BACT Limit	Add-On Controls
				procedures given in NSPS 40 CFR 60, Subpart IIII.
		Emergency ULSD Fire Pump (One 600 HP)	Total PM: 0.15-g/HP-hr	No controls The fire pumps shall comply with the emission limit and demonstrate compliance in accordance with the procedures given in NSPS 40 CFR 60, Subpart IIII.
Idaho Power Company ID-0018	6/25/10	750 KW Emergency Diesel Generator	PM: 0.2 g/KW-H -H	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389	12/29/09	2000 KW Emergency ULSD Generator	Total PM: 0.2 g/KW-H Total PM_{10}: 0.0573 g/KW-H	Engine design and operation, 15 ppm sulfur fuel Operational Limits: 1 hr/day, 500 hrs/yr for $PM_{2.5}$ NAAQS
Verenium (FL-0318)	12/10/09	2000 KW Emergency generators	Total PM: 0.2 g/KW-H	None
		Emergency ULSD Fired Pump	Total PM: 0.15-g/HP-hr	The fire pump engine is an Emergency Stationary Compression Ignition Internal Combustion Engine (Stationary ICE) and shall comply with applicable provisions of 40 CFR 60, Subpart IIII
Lake Charles Cogeneration, LLC (LA-0231)	06/22/09	Emergency Diesel Power Generator Engines (1341 HP)	Total PM_{10} 0.06 lb/h	Comply with 40 CFR 60 Subpart IIII
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, ULSD fuel, limited to 100 hours of operation per year
		500 KW emergency	Comply with	Good combustion practices,

Facility/ RBLC ID	Permit Date	Process	$PM_{10}/PM_{2.5}$ BACT Limit	Add-On Controls
		generator	NSPS IIII	EPA certified per NSPS IIII, ULSD fuel, limited to 100 hours of operation per year
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	Total PM_{10}: 0.2 g/KW-H	None
		267 HP low sulfur diesel emergency fir pump	Total PM_{10}: 0.4 G/HP-H	

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII and good combustion/operating practices.

Step 5 – Select BACT for $PM_{10}/PM_{2.5}$ from Emergency Equipment

BACT is proposed as compliance with NSPS IIII and good combustion/operating practices.

B BACT analysis for $PM_{10}/PM_{2.5}$ Emissions from Wood Chipper (AA-102b)

The portable electric wood chipper will be used for as needed wood grinding/chipping and will be limited to 2080 hours per year of operation. Fugitive particulate emissions can occur from operation of the wood chipper (AA-102b). The wood chipper operation design will include an enclosure that will minimize fugitive dust emissions.

Step 1 – Identify Control Options

Due to the limited hours of operation and the fugitive nature of the operation, there are no control options that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from wood chippers.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

No wood chippers were identified in the RBLC database. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank the Remaining Control Technologies

The only remaining technically feasible method for control of particulate emissions resulting from operation of the wood chipper is an enclosure that will minimize fugitive dust emissions and limited hours of operation. The combination of these control methods represents the Top-Rated control.

Step 4- Evaluate the Most Effective Control

Since there are no other feasible technologies available that could achieve the same level of PM control as that being proposed for the wood chipper, equipment, economic, energy, and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

Step 5 - Select BACT

The following has been proposed as BACT for controlling PM emissions from the wood chipper:

- Operation of the wood chipper with an enclosure or similar that will minimize fugitive dust emissions;
- Limited hours of operation for the wood chipper; and
- No emission limit is being proposed for this operation since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

C BACT analysis for $PM_{10}/PM_{2.5}$ Emissions from Bulldozer Storage Pile Processing (AA-105)

Bulldozers will be used to groom and maintain the storage piles. The emissions from these operations are fugitive in nature.

Step 1 – Identify Control Options

Due to the fugitive nature of the operation, there are no add-on control options that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from bulldozing the storage piles. Review of the RBLC database and other silicon plant permits did not identify similar operations.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

Based on the nature of the operation, the only viable controls are the use of best management practices (i.e., dust minimization techniques including as needed water spray application and wind screens).

Step 3 - Rank the Remaining Control Technologies

The only remaining technically feasible method for control of particulate emissions resulting from bulldozing operations on the storage piles is the use of best management practices (i.e., dust minimization techniques including as needed water spray application and wind screens). The combination of these control methods represents the Top-Rated control.

Step 4- Evaluate the Most Effective Control

Since there are no other feasible technologies available that could achieve the same level of PM control as that being proposed for the storage pile processing operations, equipment, economic, energy, and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

Step 5 - Select BACT

The following has been proposed as BACT for controlling PM emissions from the storage pile processing (AA-105):

The proposed BACT for storage pile processing (bulldozing) associated with this project is:

- The development of a dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, wind screens and speed reduction, as required; and
- No emission limit is being proposed for this operation since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Storage Pile Wind Erosion (AA-106)

PM emissions may be generated by wind erosion from the storage piles. Because the material stored will be fairly heavy and will not consist of a fine dust-like material, potential emissions should be minimal.

Step 1 - Identification of Available $PM/PM_{10}/PM_{2.5}$ Controls

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Step 2 - Elimination of Technically Infeasible $PM/PM_{10}/PM_{2.5}$ Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.

- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.

- Implementation of fugitive dust control plan: >50% control efficiency

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis and the implementation of a fugitive dust control plan.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The following table lists existing particulate BACT determinations, for material storage pile operations. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER

Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Material Storage Areas					
Facility	**Date**	**Basis**	**Source**	**$PM/PM_{10}/PM_{2.5}$ BACT Limit**	**BACT Control Method**
Nucor Steel OH-0341	12/23/10	BACT-PSD	Scrap steel storage piles	Fugitive PM - 0.43 ton/yr Fugitive PM_{10} - 0.22 ton/yr Fugitive $PM_{2.5}$ - 0.06 ton/yr	Minimize drop height
Consolidated Environmental Management – Nucor Steel LA-0239	5/24/10	BACT-PSD	Coal Storage Pile	Total PM - 3.99 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
			Slag processing storage piles	Total PM - 1.19 ton/yr	BACT is selected to be wet suppression of dust generating sources by water sprays
			Iron Ore Pellet storage piles	Filterable PM - 13.88 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
			Flux storage piles	Filterable PM - 2.18 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
			Granulated slag storage piles	Filterable PM - 2.18 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site

Material Storage Areas					
Facility	**Date**	**Basis**	**Source**	**$PM/PM_{10}/PM_{2.5}$ BACT Limit**	**BACT Control Method**
Osceola Steel Company, Georgia	3/15/10	BACT-PSD	Slag storage piles	No Emission limit	The control method is source control, either through minimizing drop height or wet suppression of the material. In addition, roadways and stockpiles of slag to be processed will also be treated by wet suppression
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Coal Storage Piles	Fugitive PM - 12.3 tpy PM_{10}	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
			Biomass Storage Piles	Fugitive PM - 2.7 tpy PM_{10}	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
			Slag storage piles	Fugitive PM 1.6 ton/yr from wind 11.7 ton/yr load out	Use of water trucks or fire hoses to maintain high moisture content. Water applied for load out. Minimize free fall distances. Haul trucks covered.
Nucor Steel, Indiana	6/1/12	BACT-PSD	Slag Storage	<u>Opacity limits:</u> Stockpiling of slag adjacent to the grizzly feeder = 3 % Wind erosion of stockpiles = 3% Continuous stacking of processed slag to stockpiles = 3%	Fugitive Dust Control Plan

<u>Step 5 -Select BACT</u>

Proposed BACT for Material Storage Pile Operations (AA-106):

- Implementation of a fugitive dust control plan. Visible emissions from the storage piles shall be controlled by the application of water, other dust suppressants or the use of wind screens, as needed.

- No emission limit is being proposed for these operations since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Paved and Unpaved Roads

Fugitive particulate emissions can occur from paved and unpaved surfaces.

Step 1: Identify all control technologies

The RACT/BACT/LAER (RBLC) Clearinghouse and review of other permits reveal that the PM control for paved and unpaved roads includes the use dust suppressants, roadway sweeping, covering of transport vehicles, and speed limits.

Add-on Control Technology:

Watering and the use of chemical wetting agents are the principal means for control of emissions from materials handling operations involving transfer of bulk minerals in aggregate form. Dust control can be achieved by: (a) source extent reduction (e.g., mass transfer reduction), (b) source improvement related to work practices and transfer equipment such as load in and load out operations (e.g., drop height reduction, wind sheltering, moisture retention), and (c) surface treatment (e.g., wet suppression).

In most cases, good work practices provide substantial opportunities for emission reduction without the need for investment in a control application program. In particular, spillage of material caused by pile lead-out and maintenance equipment can add a large source component associated with traffic entrained dust. The traffic dust component may easily dominate over emissions from transfer of material and wind erosion. The prevention of spillage and subsequent spreading of material by vehicles traversing the area is essential to cost-effective emission control. If spillage cannot be prevented because of the need for intense use of mobile equipment in the storage pile area, then regular cleanup should be employed as a necessary mitigative measure.

Fugitive emissions from paved roadways can also be controlled by wet suppression systems. These systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems—liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. The wetting agent can be water or a combination of water and a chemical surfactant. This surfactant, or surface active agent, reduces the surface tension of the water. As a result, the quantity of liquid needed to achieve good control is reduced.

Step 2: Eliminate Technically Infeasible Options

The PM control options noted above are feasible control alternatives. Therefore, there is no elimination of technically infeasible fugitive PM control alternatives. There are no other known control alternatives (per review of the BACT/LAER clearinghouse) that have been utilized on roads.

Step 3: Rank Remaining Technically Feasible Control Options

Development of a fugitive dust control plan which includes removal of deposits on roadways, speed limitation on vehicle traffic and wet suppression techniques as needed will be employed as BACT for paved and unpaved roads.

Step 4: Evaluate the Most Effective Controls and Document the Results

The following table lists the proposed particulate BACT determination along with the existing particulate BACT determinations for the paved and unpaved roads. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse identified the following with respect to paved roads:

Facility/ RBLC ID	Permit Date	Basis	Process	PM BACT Limit	Add-On Controls
V&M Star OH-0344	1/27/11	BACT-PSD	Paved and unpaved roadways and parking areas	Fugitive PM10: 7.7 tpy	Employ best available control measures: watering, sweeping, chemical stabilization, or suppressants applied at sufficient frequencies
Nucor Steel OH-0341	12/23/10	BACT-PSD	Roadways	Fugitive PM10: 5.93 tpy	Best available control measures to include watering, resurfacing, chemical stabilization, and/or speed reduction at sufficient frequency to ensure compliance

Facility/ RBLC ID	Permit Date	Basis	Process	PM BACT Limit	Add-On Controls
Flopam, Inc. LA-0240	06/14/10	BACT-PSD	Roadway Fugitives	Total PM10: 0.04 lb/hr	Main roadway shall be paved where practical. Precautions shall be taken to prevent dust from becoming airborne
Consolidated Environmental Management, Inc LA-0239	05/24/10	BACT-PSD	Unpaved Road Fugitive Dust	18.69 lb/hr 81.85 tpy	BACT for road dust is to pave roadways where practicable including areas where the extra heavy vehicles (greater than 50 tons in weight) will not cause damage to paving. Unpaved roads shall utilize water spray or dust suppression chemicals to reduce emissions. Additionally, reduced speed limits of less than or equal to 15 mph will be enforced on all unpaved roadways
V&M Star OH-0328	04/10/09	BACT-PSD	Roadways and parking areas	Filterable PM_{10}: 12.4 tpy using AP-42 emission factors	Control measures sufficient to minimize or eliminate emissions
Rumke Sanitary Landfill OH-0330	12/23/08	BACT-PSD	Paved roadways and parking areas	Filterable PM_{10}: 15.1 tpy	Best available control measures to minimize or prevent emissions, including water flushing and sweeping of paved roads/parking areas; and applying water or other dust suppressant to unpaved roads..
Southwest Electric Power Company AR-0094	11/05/08	BACT-PSD	Roads	PM: 1.1 lb/hr	Watering/dust suppression chemicals
New Steel International, Inc. OH-0315	05/06/08	BACT-PSD	Paved roadways and parking areas	PM: 153.4 tpy fugitive dust	Control measures include application of wet suppressants, watering, speed reduction and vacuuming or sweeping

Based on information presented reviewed for this BACT analysis, the $PM_{10}/PM_{2.5}$ control measures presented above focus solely on measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping. No other applicable $PM_{10}/PM_{2.5}$ control measures were identified in this review.

BACT for paved and unpaved roads associated with this project is proposed as:

- The development of a dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required; and
- No emission limit is being proposed for emissions from paved and unpaved roads since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

Best Available Control Technology (BACT) Analysis - Emissions of NO_x

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of NO_x emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of NO_x will be controlled to the levels specified.

Nitrogen oxides formation occurs by three fundamentally different mechanisms. The principal mechanism of NO_x formation in natural gas combustion is thermal NO_x. The thermal NO_x mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most NO_x formed through the thermal NO_x mechanism occurs in the high temperature flame zone near the burners. The formation of thermal NO_x is affected by three furnace-zone factors: (1) oxygen concentration, (2) peak temperature, and (3) time of exposure at peak temperature. As these three factors increase, NO_x emission levels increase. The emission trends due to changes in these factors are fairly consistent for all types of natural gas-fired boilers and furnaces. Emission levels vary considerably with the type and size of combustor and with operating conditions (e.g., combustion air temperature, volumetric heat release rate, load, and excess oxygen level). The second mechanism of NO_x formation, called prompt NO_x, occurs through early reactions of nitrogen molecules in the combustion air and hydrocarbon radicals from the fuel. Prompt NO_x reactions occur within the flame and are usually negligible when compared to the amount of NO_x formed through the thermal NO_x mechanism. However, prompt NO_x levels may become significant with ultra-low-NO_x burners. The third mechanism of NO_x formation, called fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Due to the characteristically low fuel nitrogen content of natural gas, NO_x formation through the fuel NO_x mechanism is insignificant. [4]

NO_x Emission Sources Subject to Control Technology Evaluation

The NO_x emission sources associated with the proposed plant that are included in this NO_x BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces (SAFs);
- Natural gas fired combustion equipment; and
- Emergency equipment.

For a summary of the estimated NO_x emission rates for the sources identified above, please refer to the following table:

NO_x Emission Rates for Sources Evaluated for BACT

Equipment Description	NO_x Emission Rate (tons/year)

[4] AP 42, Fifth Edition, Volume I, Chapter 1.4: External Combustion Sources Natural Gas Combustion, July 1998

Equipment Description	NO_x Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnace (SAFs)	1892.2
Natural Gas Combustion Equipment • Ladle preheaters	14.0
Emergency Equipment: • Emergency Generators	0.02
Total	**1906.2**

BACT Analysis for NO_x Emissions from Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling NO_x emissions from plant operations:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

The following control technologies were identified and evaluated to control NO_x emissions from the semi-enclosed submerged arc furnace (SAF):

(a) Combustion Controls;

(b) Selective Catalytic Reduction (SCR);

(c) Non-Selective Catalytic Reduction (NSCR);

(d) $SCONO_x$ Catalytic Oxidation/Absorption; and

(e) Shell $DeNO_x$ System (modified SCR);

(1) Selective Non-Catalytic Reduction (SNCR) options -

(2) Exxon's Thermal $DeNO_x$ ®

(3) Nalco Fuel Tech's NO_xOUT®

(4) Low Temperature Oxidation (LTO).

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing NO_x emissions from the SAF. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) Combustion Controls - There is an entire group of combustion controls for NO_x reduction from various combustion units as follows:

1. Low Excess Air (LEA) - This control option is typically used in conjunction with some of the other options. The use of this option will result in the generation of additional CO emissions, which is another pollutant under review in this BACT analysis. In addition, LEA is not very effective for implementation in electric arc furnaces that do not operate with combustion air feeds, since the combustion option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

2. Oxyfuel Burner - The SAF system does not employ natural gas-fired oxyfuel burners, thus, this option will be excluded for further consideration in this BACT analysis.

3. Overfire Air (OFA) - This control option is geared primarily for fuel NO_x reduction, which is not the major NO_x formation mechanism from SAFs. Further, this option is associated with potential operational problems due to low primary air, creating incomplete combustion conditions. Such conditions can result in inefficient processing and unacceptable increases in tap-to-tap times. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

4. Burners Out Of Service (BOOS) - BOOS and Load Reduction (or Deration) options - incorporate a reduction in furnace load, thereby, potentially reducing NO_x formation. This reduction must be balanced, however, against a longer period of NO_x generation resulting from the furnace's inability to efficiently melt material. Furthermore, both BOOS and Load Reduction are fundamentally inconsistent with the design criterion for the furnace, which is to increase furnace loadings to achieve enhanced production. Therefore, these control options are not technically feasible for this particular application and will not be considered any further in this BACT analysis.

5. Reduced Combustion Air Temperature - This control option inhibits thermal NO_x production. However, the option is limited to equipment with combustion air preheaters which are not applicable to the silicon production operations. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

6. Flue Gas Recirculation (FGR) - FGR option involves recycling a portion of the cooled exit flue gas back into the primary combustion zone. Typically, FGR is useful in reducing thermal NO_x formation by lowering the oxygen concentration in the combustion zone. The primary limitation of FGR is that it alters the distribution of heat (resulting in cold spots) and lowers the efficiency of the furnace. Since it may be necessary to add additional burners (hence, increasing emissions of other pollutants) to the SAF to reduce the formation of cold spots, FGR technology to reduce SAF NO_x emissions is not considered feasible. Since the SAF does not operate on burner combustion, but relies upon the electric arc and chemical energy for oxidation, neither pathway is amenable to FGR application. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(b) Selective Catalytic Reduction (SCR) -- In this process, ammonia (NH_3), usually diluted with air or steam, is injected through a grid system into the exhaust gas stream upstream of a catalyst bed. On the catalyst surface the NH_3 reacts with NO_x to form molecular nitrogen and water. The basic reactions are as follows:

$$4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6H_2O \text{ (i)}$$

$$8NH_3 + 6NO_2 \rightarrow 7N_2 + 12H_2O \text{ (ii)}$$

The reactions take place on the surface of the catalyst. Usually, a fixed bed catalytic reactor is used for SCR systems. The function of the catalyst is to effectively lower the technology include the catalyst reactor design, optimum operating temperature, sulfur content of the charge, catalyst deactivation due to aging, ammonia slip emissions and design of the ammonia injection system.

Depending on system design, NO_x removal of 80 - 90 percent may be achievable under optimum conditions (refer, USEPA "ACT Document - NO_x Emissions from Iron and Silicon productions", Sept., 1994). The reaction of NH_3 and NO_x is favored by the presence of excess oxygen. Another variable affecting NO_x reduction is exhaust gas temperature. The greatest NO_x reduction occurs within a reaction window at catalyst bed temperatures between 600 °F – 750 °F for conventional (vanadium or titanium-based) catalyst types, and 470 °F – 510 °F for platinum-based catalysts. Performance for a given catalyst depends largely on the temperature of the exhaust gas stream being treated. A given catalyst exhibits optimum performance when the temperature of the exhaust gas stream is at the midpoint of the reaction temperature window for applications where exhaust gas oxygen concentrations are greater than 1 percent. Below the optimum temperature range, the catalyst activity is greatly reduced, potentially allowing unreacted ammonia (referred to as "ammonia slip") to be emitted directly to the atmosphere.

The SCR system may also be subject to catalyst deactivation over time. Catalyst deactivation occurs through two primary mechanisms – physical deactivation and chemical poisoning. Physical deactivation is generally the result of either continual exposure to thermal cycling or masking of the catalyst due to entrainment of particulates or internal contaminants. Catalytic poisoning is caused by the irreversible reaction of the catalyst with a contaminant in the gas stream. Catalyst suppliers typically guarantee a 3-year catalyst lifetime for a sustainable emission limit.

In order for an SCR system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates, NO_x concentrations, and temperature. In addition, certain elements such as iron, nickel, chrome, and zinc can react with platinum catalysts to form compounds or alloys which are not catalytically active. These reactions are termed "catalytic poisoning", and can result in premature replacement of the catalyst. An SAF flue gas may contain a number of these catalytic poisons. In addition, any solid material in the gas stream can form deposits and result in fouling or masking of the catalytic surface. Fouling occurs when solids obstruct the cell openings within the catalyst. Masking occurs when a film forms on the surface of catalyst over time. The film prevents contact between the catalytic surface and the flue gas. Both of these conditions can result in frequent cleaning and/or replacement requirements. Due to the above effective technical applicability constraints, SCR technology has never been applied to silicon production operations, and will be eliminated for further evaluation in this BACT analysis.

(c) Non-Selective Catalytic Reduction (NSCR) - The NSCR system is a post-combustion add-on exhaust gas treatment system. It is often referred to as a "three-way conversion" catalyst since it reduces NO_x, unburned hydrocarbons (UBH), and CO simultaneously. In order to operate properly, the combustion process must be stoichiometric or near stoichiometric which is not maintained in an SAF and varies widely under regular operation. Under stoichiometric conditions, in the presence of the catalyst, NO_x is reduced by

CO, resulting in nitrogen and carbon dioxide. Currently, NSCR systems are limited to rich-burn IC engines with fuel rich ignition system applications. In view of the above limitations, the NSCR option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(d) $SCONO_x$-Catalytic Oxidation/Absorption -- This is a catalytic oxidation/absorption technology that has been applied for reductions of NO_x, CO and VOC from an assortment of combustion applications that mostly include – small turbines, boilers and lean-burn engines. However, this technology has never been applied to silicon production operations.

An effective $SCONO_x$ application to a SAF has the following reservations:

(1) The technology is not readily adaptable to high-temperature applications outside the 300-700 °F range and is susceptible to thermal cycling that will be experienced in the MS Silicon application;

(2) Scale-up is still an issue. The technology has not been demonstrated for larger applications;

(3) Optimum $SCONO_x$ operation is predicated by stable gas flow rates, NO_x concentrations and temperature. As discussed earlier, the nature of SAF operations does not afford any of these conditions which will significantly impair the effective control efficiency of the $SCONO_x$ system;

(4) The catalyst is susceptible to moisture interference and the vendor indicates negation of its warranties and performance guarantees if the catalyst is exposed to any quantity of liquid water. However, during certain atmospheric conditions, the catalyst could be potentially exposed to moisture following a unit shutdown;

(5) The prospect of moving louvers that effect the isolation of the saturated catalyst readily lends itself to the possibility of thermal warp and in-duct malfunctions in general. The process is dependent on numerous hot-side dampers that must cycle every 10-15 minutes. Directional flow solutions are not yet known to have been implemented for this technology;

(6) The K_2CO_3 coating on the catalyst surface is an active chemical reaction and reformulation site which makes it particularly vulnerable to fouling. On some field installations, the coating has been found to be friable and tends to foul in the harsh in-duct environment;

(7) During the regeneration step, the addition of the flammable reducing gas (natural gas which contains 85% methane) into the hot flue gas generates the possibility of LEL exceedances and subsequently catastrophic failure in the event the catalyst isolation is not hermetic or there is a failure in the carrier steam flow; and

(8) There is a possibility of some additional SO_2 emissions if the dry scrubber with the tandem "guard-bed" $SCOSO_x$ unit experiences a malfunction. Thus, there are significant reservations regarding effective technical applicability of this control alternative for a silicon production SAF application. Moreover $SCONO_x$ technology has never been proposed nor successfully implemented for similar industry applications. In view of the above limitations, $SCONO_x$ is considered technically infeasible for the present application and will not be considered any further in this BACT analysis.

(e) Shell $DeNO_x$ System (modified SCR) - The Shell $DeNO_x$ system is a variant of traditional SCR technology which utilizes a high activity dedicated ammonia oxidation catalyst based on a combination of metal oxides. The system is comprised of a catalyst contained in a modular reactor housing where in the presence of ammonia NO_x in the exhaust gas is converted to nitrogen and water. The catalyst is contained in a low-pressure drop lateral flow reactor (LFR), which makes best use of the plot space available. Due to

the intrinsically high activity of the catalyst, the technology is suited for NO_x conversions at lower temperatures with a typical operating range of 250-660 °F.

The low temperature operation is the only aspect of the Shell $DeNO_x$ technology that marks its variance from traditional SCR technology. From an SAF application standpoint, there are no additional differences between this technology and SCR technology.

In summary, an effective Shell $DeNO_x$ application to the SAF application has the following reservations:

(1) The Shell $DeNO_x$ system does not suffer from similar placement limitation considerations discussed earlier for SCRs. However, even a downstream of the SAF baghouse placement of the system does not render it completely safe from the prospect of particulate fouling. The catalyst will still be exposed to particulates, which can inflict a masking effect impairing the effective control efficiency of the system;

(2) Optimum Shell $DeNO_x$ operation is predicated by stable gas flow rates, NO_x concentrations and temperature. The nature of silicon production operations does not afford any of these conditions which will significantly impair the effective control efficiency of the Shell $DeNO_x$ system;

(3) The catalyst is particularly susceptible to thermal fluctuations;

(4) The use of relatively large amounts of ammonia - a regulated toxic chemical – will have accidental release and hazardous impact implications; and

(5) Even a 7 parts per million by volume (ppmv) ammonia slip from a 500,000 acfm exhaust gas flow can result in a significant increase of emissions of ammonia which is a regulated hazardous air pollutant with well documented health impacts.

Thus, there are significant reservations regarding effective technical applicability of this control alternative for an SAF application. Moreover Shell $DeNO_x$ has never been proposed nor successfully implemented for similar applications. Therefore, the Shell $DeNO_x$ option is considered technically infeasible and will not be considered any further in this BACT analysis.

(f) Selective Non-Catalytic Reduction (SNCR) - The three commercially available SNCR systems are Exxon's Thermal $DeNO_x$ ® system, Nalco Fuel Tech's NO_xOUT® system and Low Temperature Oxidation (LTO). These technologies are reviewed below for technical feasibility in controlling SAF NO_x emissions.

(1) Exxon's Thermal $DeNO_x$ ® - Exxon's Thermal $DeNO_x$ ® system is a non-catalytic process for NOx reduction. The process involves the injection of gas-phase ammonia (NH_3) into the exhaust gas stream to react with NO_x. The ammonia and NO_x react according to the following competing reactions:

$$2NO + 4NH_3 + 2O_2 \rightarrow 3N_2 + 6H_2O \text{ (i)}$$

$$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O \text{ (ii)}$$

The temperature of the exhaust gas stream is the primary criterion controlling the above selective reaction. Reaction (i) dominates in the temperature window of 1,600 °F - 2,200 °F resulting in a reduction of NO_x. However above 2,200 °F, reaction (ii) begins to dominate, resulting in enhanced NO_x production. Below 1,600 °F, neither reaction has sufficient activity to produce or destroy NOx. Thus, the optimum temperature window for the Thermal $DeNO_x$® process is approximately 1,600 °F - 1,900 °F. The above reaction temperature window can be shifted down to approximately 1,300 °F - 1,500 °F with the introduction of readily oxidizable hydrogen gas. In addition, the process also requires

a minimum of 1.0 second residence time in the desired temperature window for any significant NO_x reduction.

In order for the Thermal $DeNO_x$ ® system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates; ensuring the required residence time and be within the prescribed temperature range. Based on review of readily available information, application of Thermal $DeNO_x$® technology to control NO_x emissions from silicon production operations are not known. Therefore, this option is considered technically infeasible and will not be considered any further in this BACT analysis.

In summary, an effective Thermal $DeNO_x$ ® application to the SAF application has the following reservations:

(A) The placement of the Thermal $DeNO_x$ ® system in an adequate temperature regime. In order to achieve optimum operational efficiency the system should be located in a temperature region of at least 1,300 °F and preferably between 1,600 °F - 1,900 °F which would put it upstream of the SAF baghouse. Such a placement configuration would not afford the desired temperature range, which would be typically in the region of 300 °F - 400 °F with an entry temperature of 250 °F at the inlet to the SAF baghouse. The system cannot be placed further upstream for operational hazard reasons. Also any injection mechanism upstream of the baghouse will be susceptible to prompt particulate fouling;

(B) Optimum Thermal $DeNO_x$ ® operation is predicated by stable gas flow rates, NO_x concentrations and temperature. The nature of silicon production operations does not afford any of these conditions which will significantly impair the effective control efficiency of the Thermal $DeNO_x$ ® system; and

(C) The use of relatively large amounts of ammonia - a regulated toxic chemical - will have accidental release and hazardous impact implications.

(2) Nalco Fuel Tech's NO_xOUT® - The NO_xOUT® process is very similar in principle to the Thermal $DeNO_x$ ® process, except that it involves the injection of a liquid urea (NH_2CONH_2) compound (as opposed to NH_3) into the high temperature combustion zone to promote NO_x reduction. The chemical reaction proceeds as follows:

$$NH_2 + NO \rightarrow N_2 + H_2O \text{ (i)}$$

The reaction involves the decomposition of urea at temperatures of approximately 1,700 °F - 3,000 °F. Certain proprietary additive developments have allowed the operational temperature window to shift to approximately 1,400 °F - 2,000 °F. However, the process still has similar constraints as the Thermal $DeNO_x$ ® system. The limitations are dictated by the reaction-controlling variables such as stable gas flow rates for a minimum residence time of 1.0 second in the desired temperature window to ensure proper mixing.

As with the Thermal $DeNO_x$ ® system, the NO_xOUT® system suffers from essentially similar limitations to effectively reduce NOx emissions from SAF operations. Moreover, applications of the NO_xOUT® technology to control NOx emissions from silicon production operations are not known. Therefore, this option is considered technically infeasible and will not be considered any further in this BACT analysis.

Similar to the Thermal $DeNO_x$® application, an effective NO_xOUT® application to the SAF application has the following reservations:

(A) The placement of the NO_xOUT® system in an adequate temperature regime. In order to achieve optimum operational efficiency the system should be located in a temperature region preferably between 1,400 °F - 2,000 °F which would put it upstream of the SAF baghouse. Firstly, such a placement configuration would not afford the desired temperature range, which would be typically in the region of 300 °F -400 °F with an entry temperature of 250 °F at the inlet to the SAF baghouse. Also any injection mechanism upstream of the baghouse will be susceptible to prompt particulate fouling;

There are significant reservations regarding effective technical applicability of this control alternative for an SAF application. In order for the NO_xOUT® system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates, ensuring the requisite residence time requirements and temperature. The temperature of the SAF exhaust gas will vary widely over the melt cycle, and will not remain in the desired temperature window during all phases of operation. Similarly, the gas flow rates will not remain stable during furnace operation, precluding the possibility of adequate residence time. Moreover, NO_xOUT® technology has never been proposed nor successfully implemented to control NO_x emissions from SAFs.

(3) Low Temperature Oxidation (LTO) - LTO technology has never been utilized for any silicon production application. The technology is a variant of SNCR technology using ozone. The ozone is injected into the gas stream and the NO_x in the gas stream is oxidized to nitrogen pentoxide (N_2O_5) vapor, which is absorbed in the scrubber as dilute nitric acid (HNO_3). The nitric acid is then neutralized with caustic (NaOH) in the scrubber water forming sodium nitrate ($NaNO_3$). The overall chemical reaction can be summarized as follows:

$$NO_2 + NO + 2O_3 + NaOH \rightarrow HNO_3 + NaNO_3 + 2O_2 \quad (i)$$

For optimal performance, the technology requires stable gas flows, lack of thermal cycling, invariant pollutant concentrations and residence times on the order of 1 - 1.5 seconds. In addition, LTO technology requires frequent calibration of analytical instruments, which sense the NO_x concentrations for proper adjustment of ozone injection. Since LTO uses ozone injection, it has a potential for ozone slip, which can vary between 5 - 10 ppmv. Also, the technology requires a cooler flue gas of less than 300 °F at the point of ozone injection; otherwise the reactive gas is rendered redundant. The technology also suffers from low NO_x conversion rates (40% - 60%), potential for nitric acid vapor release (in the event of a scrubber malfunction) with subsequent regional haze impacts and the handling, treatment and disposal issues for the spent scrubber effluent.

The technology is neither applicable nor proven for silicon production SAF applications and attendant limitations render it technically infeasible in its current manifestation. In view of the above, the LTO control option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

All control alternatives identified in Step 2 were eliminated as not technically feasible for controlling NO_x emissions from the silicon production operations, with the exception of good operating combustion practices.

Step 4 – Evaluate the Most Effective Controls and Document Results

Good operating and combustion practices were the only technically feasible control option in controlling NO_x emissions from the SAF.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for SAFs or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to SAFs at silicon production plants:

Facility/ RBLC ID	Permit Date	Process	NO_x Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	NOx: 87.6 lb/hr Capacity: 22 MW/hr NOx: 4.0 lbs/MW	No control
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	NOx: 66.0 lb/hr Capacity: 20 MW/hr NOx: 3.3 lbs/MW	No control
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	NOx: 462 tpy NOx: 110 lb/hr Nominal Capacity: 18,000 tons/yr NOx: 51.3 lbs/ton silicon	No controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	None	No controls

As shown in the above table, NO_x emissions from SAFs are uncontrolled. None of the sources as reflected in the above table have proposed or successfully implemented any add-on control devices to control NO_x emissions from SAFs operation.

MS Silicon is proposing the NO_x BACT for the SAFs (AA-201) as follows:

- **NO_x emissions from each of the SAFs shall be limited to 45 lbs/ton (averaged over a 30-day period) of silicon produced.**

BACT Analysis for NO_x Emissions from Natural Gas Combustion

Natural Gas Combustion Sources – Includes the following:

- Ladle Pre-Heaters (4 – 10.0 MMBtu/hr): 14 tpy NO_x;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control NO_x that is emitted at from each combustion unit. See below table for summary of NO_x BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	NO_x BACT Limit	Controls
SeverCorr LLC Columbus, Mississippi	07/15/11	BACT-PSD	Ladle preheaters, ladle dry-out heaters, Tundish preheaters, Tundish dry-out heaters, vertical ladle holding station	0.08 to 0.1 lb/MMBtu	Combustion of natural gas only
Nucor Steel, Marion, Inc. OH-0341	12/23/10	BACT-PSD	Ladle preheaters, tundish preheaters	Mass emission rate of 27.60 lb/hr	Use of natural gas low NO_x burners.
Osceola Steel Co., Adel, Georgia	3/15/10	BACT-PSD	Preheaters	0.1 lb/MMBtu	Combustion of natural gas, good combustion practices
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	3 Ladle Preheater and 2 refractory drying	0.10 lb/MMBtu	Combustion of natural gas
Minnesota Steel Industries, LLC MN-0070	09/07/07	BACT-PSD	Ladle/Tundish Preheater	No limit	Natural gas combustion and low NO_x burners
Gerdau Ameristeel Wilton IA-0087	05/29/07	BACT-PSD	North Ladle Dryer, South Ladle Dryer and Preheaters, Northwest Ladle Dryers	100 lb/mmscf	Good combustion practices

Facility/ RBLC ID	Permit Date	Basis	Process	NO_x BACT Limit	Controls
Nucor Steel AR-0090	04/03/06	BACT-PSD	Ladle Dryer	0.1000 lb/MMBtu	Low NO_x burners
Republic Engineered Products, Inc. OH-0303	08/30/05	LAER	Ladle Dryers/Preheaters	0.1000 lb/MMBtu	Low NO_x burners
Charter Manufacturing Co. Inc. Charter Steel OH-0276	06/10/04	BACT-PSD	Ladle Preheater and Dryers	0.98 lb/hr 4.29 ton/yr Limits are for each preheater	None
Nucor Corp TX-0417	1/15/03	BACT-PSD	Process heaters, ladle and tundish	0.100 lb/MMBtu	Low NO_x burners and clean fuel
Nucor Steel IN-0090	01/19/01		6 Ladle Preheaters	0.100 lb/MMBtu, 6.0 lb/hr total	Low NO_x burners

As shown in the above table, no controls other than low NO_x burners, good combustion practices and combustion of clean fuel are used for NO_x emissions from the natural gas combustion equipment.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling NO_x emissions. No similar sized natural gas combustion devices were identified using add-on NO_x controls as BACT.

Thus, BACT is defined as combustion of clean fuel, low NO_X burners, and good combustion practices. For the natural gas combustion sources associated with the proposed Plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of NO_x control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

Thus, BACT is defined as:

- **NO_x emission rate of 0.08 lbs/MMBtu;**
- **Low NO_x or equivalent burners/technology;**
- **Combustion of clean fuel; and**
- **Good combustion practices.**

BACT Analysis for NO_x Emissions from Emergency Equipment (AA-501)

Emergency Equipment – Includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP):0.02 tpy NO_x;

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control NO_x that is emitted from emergency generators. See below table for summary of NO_x BACT determinations from the RBLC database:

Step 2 - Technical Feasibility of NO_x Control Alternatives

The emergency distillate generator will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. The projected annual NOx emissions rate is 0.02 tpy. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of NO_x emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control NO_x emissions from the emergency generator, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach. The following table lists the existing NO_x BACT determinations for diesel fired emergency generators. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	NO_x BACT Limit	Add-On Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	6.4 G/KW-H NOX+NMHC	No controls The emergency generators shall comply with the emission limit and demonstrate compliance in accordance with the procedures given in NSPS 40 CFR 60, Subpart IIII.
Idaho Power Company (ID-0018)	6/25/10	Emergency Diesel Generator	6.4 G/KW-H NOx+NMHC	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389	12/29/09	Emergency ULSD Generator	6.4 G/KW-H NOx+NMHC	Engine design and operation
Verenium (FL-0318)	12/10/09	Emergency generators	6.4 G/KW-H NOx+NMHC	None

Lake Charles Cogeneration, LLC (LA-0231)	06/22/09	Emergency Diesel Power Generator Engines (1341 HP)	17.09 lb/h	Comply with 40 CFR 60 Subpart IIII
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII
		500 KW emergency generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	6.4 G/KW-H NOx+NMHC	None

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII; good combustion/operating practices, and the use of ultra-low sulfur diesel (ULSD) fuel.

Step 5 – Select BACT for NO_x from Emergency Equipment (AA-501)

BACT is proposed as:

- **Compliance with NSPS IIII;**
- **Good combustion/operating practices, and**
- **Use of ULSD.**

Best Available Control Technology (BACT) Analysis - Emissions of CO

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of CO emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of CO will be controlled to the levels specified.

Large amounts of carbon monoxide and organic materials are emitted by submerged electric arc furnaces. Carbon monoxide is formed as a byproduct of the chemical reaction between oxygen in the metal oxides of the charge and carbon contained in the reducing agent (coke, coal, etc.). Reduction gases containing organic compounds and carbon monoxide continuously rise from the high-temperature reaction zone, entraining fine particles and fume precursors. The mass weight of carbon monoxide produced sometimes exceeds that of the metallic product.[5]

CO Emission Sources Subject to Control Technology Evaluation

The CO emission sources associated with the proposed plant that are included in this CO BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces;
- Natural gas fired combustion equipment; and
- Emergency equipment.

For a summary of the estimated CO emission rates for the sources identified above, please refer to the following table:

CO Emission Rates for Sources Evaluated for BACT

Equipment Description	CO Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnace	1429.6
Natural Gas Combustion Equipment • Ladle preheaters	14.4
Emergency Equipment: • Emergency Generator	0.19
Total	1444.3

[5] AP-42 Chapter 12.4 Ferroalloy Production, 10/86

A summary of the BACT determinations for CO is presented in Table 4-4.

BACT Analysis for CO Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling emissions from the semi-enclosed submerged electric arc furnaces:

1. On-line USEPA Control Technology Database; and
2. State Air Quality Permits

The following control technologies were identified and evaluated to control CO emissions from the SAFs:

(a) Operating Practice Modifications;

(b) Flaring of CO Emissions;

(c) CO Oxidation Catalysts;

(d) Post-Combustion Reaction Chamber;

(e) Catalytic Incineration; and

(f) Oxygen Injection.

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing CO emissions from the SAF. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) Operating Practice Modifications -- Due to marketplace demands on the type of products to be manufactured and the required product quality, MS Silicon does not propose any additional operating practice modifications that will alter CO emissions from the existing semi-enclosed SAF. Therefore, this control option will be eliminated for further evaluation in this BACT analysis.

(b) Flaring of CO Emissions -- Based upon a review of the previously listed information resources, there is no known application of flaring SAF exhaust gases. Flaring of emissions for CO destruction would require raising the exhaust gas temperature. Thus, based on the relatively large gas volumetric flow at a substantial temperature differential, the auxiliary fuel requirements needed to operate the flare would be overwhelmingly large. Additionally, it can be speculated as to whether the flare would actually result in a decrease of CO emissions or increase thereof from supplemental fuel combustion, which would also result in an increase of NO_x emissions. Consequently, this control alternative is considered technically infeasible for SAF exhausts and thus, will not be considered any further in this BACT analysis.

(c) CO Oxidation Catalysts -- Based upon a review of the previously listed information resources, there is no known application of CO oxidation catalysts to control CO emissions from a SAF. The

optimal working temperature range for CO oxidation catalysts is approximately 850 °F - 1,100 °F with a minimum exhaust gas stream temperature of 500 °F for minimally acceptable CO control. Exhaust gases from the SAF will undergo rapid cooling as they are ducted from the furnace. Thus, the temperature will be far below the minimum 500 °F threshold for effective operation of CO oxidation catalysts. Additionally, the particulate loading in the exhaust gas stream is anticipated to be too high for efficient operation of a CO oxidation catalyst. Masking effects such as plugging and coating of the catalyst surface would almost certainly result in impractical maintenance requirements, and would significantly degrade the performance of the catalyst. Consequently, this control alternative is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(d) Post-Combustion Reaction Chambers -- Based upon a review of the previously listed information resources, there is no known successful application of duct burners or thermal incinerators to control CO emissions from silicon production operations. The feasibility of these units to effectively reduce CO emissions, without resulting in severe operational problems, is unknown. Further, such units are expected to consume large quantities of natural gas and oxygen; resulting in excessive annual operating costs.

The principle of destruction within post combustion chambers is to raise the SAF exhaust gases to a sufficiently high temperature and for a minimum amount of time to facilitate oxidation. The combustion chamber configuration must provide effective mixing within the chamber with an acceptable residence time. Recuperative heat exchangers can be used with these systems to recover a portion of the exiting exhaust gas heat and reduce the auxiliary fuel consumption.

The amount of CO which could be oxidized with post combustion systems is uncertain, and precise performance guarantees are expected to be difficult to obtain from equipment manufacturers because of the lack of operating experience. In addition, there is the potential for additional emissions of CO from auxiliary fuel combustion. Further, due to the heat and particulate loading, the burners would have a short life expectancy, and may sustain severe maintenance and reliability problems. Additionally, a single or multiple duct burner system would not be able to heat the relatively cool gases from the SAF during cold cycling. Potentially, there are two locations where post combustion chambers can be installed, i.e., upstream or downstream of an SAF baghouse. Locating upstream of the baghouse would take advantage of slightly elevated temperatures in the exhaust gas stream. However, at this location, the post combustion chamber would be subject to high particulate loading. The units would be expected to foul frequently from the particulate accumulation, and the burners would have severe maintenance and reliability problems. Thus, the installation of the post combustion chamber upstream of the baghouse is considered technically infeasible. Alternatively, the post combustion chamber could be installed downstream of the SAF baghouse. However, even at this location, fouling due to particulate matter can occur and more importantly, even cooler exhaust temperatures would be encountered. These cooler temperatures would greatly increase the auxiliary fuel requirements. Further, the combustion of additional fuel will result in increases in emissions to the atmosphere.

Based upon the above discussions, the use of a post combustion chamber is considered technically infeasible for the silicon production operations and will not be considered any further in this BACT analysis.

(e) Catalytic Incineration -- Based upon a review of the previously listed information resources, there is no known application of catalytic incineration to control CO emissions from silicon

production operations. Catalytic incinerators use a bed of catalyst that facilitates the overall combustion of combustible gases. The catalyst increases the reaction rate and allows the conversion of CO to CO_2 at lower temperatures than a thermal incinerator. The catalyst is typically a porous noble metal material which is supported in individual compartments within the unit. An auxiliary fuel-fired burner ahead of the bed heats the entering exhaust gases to 500 °F – 600 °F to maintain proper bed temperature. Recuperative heat exchangers are used to recover the exiting exhaust gas heat and reduce the auxiliary fuel consumption. Secondary energy recovery is typically 70 percent.

Catalytic incineration systems are limited in application due to potential poisoning, deactivation, and/or blinding of the catalyst. Lead, arsenic, vanadium, and phosphorus are generally considered poisons to catalysts and deactivate the available reaction sites on the catalyst surface. Particulate can also build up on the catalyst, effectively blocking the porous catalyst matrix and rendering the catalyst inactive. In cases of significant levels of poisoning compounds and particulate loading, catalyst replacement costs are significant.

As in the thermal incineration discussion, potentially, there are two locations where the incinerator can be installed, i.e., upstream or downstream of the SAF baghouse. For the same reasons discussed earlier (e.g., fouling due to particulate matter), the upstream location is considered technically infeasible. Alternatively, the incinerator can be installed downstream of the meltshop baghouse. However, even at this location, fouling due to particulate matter can occur, and further, the exhaust will be at a lower temperature. These cooler temperatures would greatly increase the auxiliary fuel requirements. The associated combustion of additional auxiliary fuel will result in an unacceptable increase in operating costs. Further, the combustion of additional fuel will result in increases in emissions to the atmosphere.

Due to the lack of application of catalytic incineration for SAFs and potentially adverse technology applicability issues, this control alternative is considered technically infeasible and will not be considered any further in this BACT analysis.

(f) Oxygen Injection -- Based upon a review of the previously-listed information resources, there is no known application of oxygen injection for controlling CO emissions from SAFs.

A theoretical means of reducing CO would be oxygen injection at the entrance of the ductwork to increase oxidation of the available CO to CO_2. The increase in CO oxidation which could be achieved, however, is unknown. This approach would be purely experimental and is a procedure that is currently not conducted in silicon production operations in silicon productions in the United States. Consequently, this control alternative is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

All control alternatives identified in Step 2 were eliminated as not technically feasible for controlling CO emissions from the SAF.

Step 4 – Evaluate the Most Effective Controls and Document Results

Good operating practices are only technically feasible control option in controlling CO emissions from the SAF.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to submerged electric arc furnaces at silicon production plants:

Facility/ RBLC ID	Permit Date	Process	CO Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	No limit	No control
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	CO: 88.9 lb/hr Capacity: 20 MW/hr CO: 4.4 lbs/MW	No control
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	CO: 54.0 lb/hr Nominal Capacity: 2 tons/hr CO: 27 lbs/ton silicon	No controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	None	No controls

As shown in the above table, CO emissions from submerged electric arc furnaces are uncontrolled. None of the sources as reflected in the above table have proposed or successfully implemented any add-on control devices to control CO emissions from SAF operation.

MS Silicon is proposing the BACT for CO as follows:

- **Total CO emissions from the SAF shall be limited to 34 lbs/ton (averaged over a 30-day period) of silicon produced;**
- **Good combustion and operating practices; and**
- **Utilization of a semi-enclosed SAF design.**

BACT Analysis for CO Emissions from Natural Gas Combustion (AA-202)

Natural Gas Combustion Sources – Includes the following:

- Ladle Pre-Heaters (4 – 10.0 MMBtu/hr): 14.4 tpy CO;

Step 1 – Identify Control Options,

According to information available in the RBLC, EPA's Compilation of Air Pollutant Emission Factors and the EPA's CATC Technical Bulletins and Air Pollution Control Technology Fact Sheets, there are no reasonably available add-on control options to control CO emissions from natural gas combustion units. This review did not identify natural gas combustion equipment associated with silicon production employing add-on controls to control combustion related emissions from natural gas combustion sources.

Step 2 – Eliminate Technically Infeasible Control Options

No technically feasible control options were identified to control the small quantities of CO from similar sized natural gas combustion equipment.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

No technically feasible control options were identified.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling CO emissions. No similar sized natural gas combustion devices were identified add-on CO controls as BACT.

Facility/RBLC ID	Permit Date	Basis	Process	CO BACT Limit	Add-On Controls
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	Ladle Preheater and refractory drying	0.0840 lb/MMBtu	Combustion of natural gas
New Steel International, Inc OH—0315	5/6/08	BACT-PSD	Tundish Preheaters	0.0840 lb/MMBtu	Natural gas combustion

Facility/RBLC ID	Permit Date	Basis	Process	CO BACT Limit	Add-On Controls
Gerdau Ameristeel Wilton IA-0087	05/29/07	BACT-PSD	North Ladle Dryer, South Ladle Dryer and Preheaters, Northwest Ladle Dryers	84 lb/mmscf	Good combustion practices
Nucor Steel AR-0090	04/03/06	BACT-PSD	Ladle Dryer	0.0840 lb/MMBtu	Good combustion practice
Republic Engineered Products, Inc OH-0303	08/30/05	LAER	Ladle Dryers/Preheaters	84.0 lb/Mmscf	Best operational and engineering practices
Charter Manufacturing Co. Inc. Charter Steel OH-0276	06/10/04	BACT-PSD	Tundish Preheaters	0.0820 lb/MMBtu each preheater	None
Charter Manufacturing Co. Inc. Charter Steel OH-0276	06/10/04	BACT-PSD	Ladle Preheater and Dryers	0.0820 lb/MMBtu each preheater	None
Nucor Steel IN-0090	01/19/01	BACT-PSD	Tundish Preheaters	No limit	Use of natural gas
Nucor Steel IN-0090	01/19/01	BACT-PSD	Ladle Preheaters	No limit	Natural gas or propane combustion

As shown in the above table, no controls other than good combustion practices and combustion of clean fuel are used for CO emissions from the natural gas combustion equipment. The variation of 0.0820 to 0.0840 lb/MMBtu is based on different heating values for natural gas.

Thus, BACT for CO emissions from equipment combusting natural gas is defined as:

- **CO emission rate of 0.0840 lbs/MMBtu;**
- **Combustion of natural gas; and**
- **Good combustion practices.**

BACT Analysis for CO Emissions from Emergency Equipment (AA-501)

Emergency Equipment – Includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP): 0.7 tpy CO.

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control CO that is emitted from emergency equipment. See below table for summary of CO BACT determinations from the RBLC database:

Step 2 - Technical Feasibility of CO Control Alternatives

The emergency diesel fired generator will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for less than 100 hours per year. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of CO emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control CO emissions from the emergency generator, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing CO BACT determinations for diesel fired emergency generators. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	CO BACT Limit	Add-On Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	3.5 G/KW-H	No controls The emergency generators shall comply with the emission limit and demonstrate compliance in accordance with the procedures

Facility/ RBLC ID	Permit Date	Process	CO BACT Limit	Add-On Controls
				given in NSPS 40 CFR 60, Subpart IIII.
Idaho Power Company ID-0018	6/25/10	750 KW Emergency Diesel Generator	3.5 G/KW-H	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389	12/29/09	2000 KW Emergency ULSD Generator	3.5 G/KW-H	Engine design and operation
Verenium (FL-0318)	12/10/09	2000 KW Emergency generators	3.5 G/KW-H	None
Lake Charles Cogeneration, LLC (LA-0231)	06/22/09	Emergency Diesel Power Generator Engines (1341 HP)	0.62 lb/h	Comply with 40 CFR 60 Subpart IIII
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, limited to 100 hours of operation per year
		500 KW emergency generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, limited to 100 hours of operation per year
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	3.5 G/KW-H	None

As shown in the table above, BACT for the emergency equipment has been determined to be compliance with NSPS IIII and good combustion/operating practices

Step 5 – Select BACT for CO from Emergency Equipment

BACT for CO emissions from the emergency equipment is proposed as:

- **Compliance with NSPS IIII; and Good combustion/operating practices.**

Best Available Control Technology (BACT) Analysis - Emissions of SO_2

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of SO_2 emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes.

The source of SO_2 emissions is attributable to the sulfur content of the raw materials charged in the SAFs and from the sulfur content of the fuels to be combusted in supporting operations to be performed at the plant.

SO2 Emission Sources Subject to Control Technology Evaluation

The SO_2 emission sources associated with the proposed plant that are included in this SO_2 BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces;
- Natural gas fired combustion equipment; and
- Emergency equipment.

For a summary of the estimated SO_2 emission rates for the sources identified above, please refer to the following table:

SO_2 Emission Rates for Sources Evaluated for BACT

Equipment Description	SO_2 Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnace	2169.7
Natural Gas Combustion Equipment • Ladle preheaters	0.10
Emergency Equipment: • Emergency Generator	0.27
Total	2170.0

BACT Analysis for SO_2 Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling SO_2 emissions from plant operations:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

The following control technologies were identified and evaluated to control SO_2 emissions from the SAFs:

(a) Lower-Sulfur Charge Substitution; and

(b) Flue Gas Desulfurization (FGD) options:

(1) Wet Scrubbing;

(2) Spray Dryer Absorption (SDA); and

(3) Dry Sorbent Injection (DSI).

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing SO_2 emissions from the SAFs. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) Lower-Sulfur Charge Materials - Substitution with lower sulfur-bearing raw materials is technically feasible and will be included in this analysis. A summary of the charge materials and sulfur content of the materials, are described below.

Coal - The Department of Energy estimates that the use of the lowest sulfur coal can result in up to 85 percent lower SO_2 emissions than the use of many types of higher sulfur coal[6]. In the U.S., coal from eastern states including Ohio, Pennsylvania, and West Virginia has higher sulfur content, accounting for 3 to 10 percent of the coal's weight; coal from western states such as Wyoming, Montana, Utah, and Colorado can have sulfur contents that make up less than 1 percent of its weight[7]. However, low-sulfur coal is significantly more expensive than higher sulfur coal, and often incurs additional transportation costs. MS Silicon will work to utilize the lowest cost effective, available coal source. The success of the plant is to produce a high quality silicon product that is cost competitive within the industry. MS Silicon will be utilizing a best available SAF and supporting equipment to:

1) Produce a cost competitive product;

2) Minimizes emissions of regulated air pollutants; and

3) Utilize good combustion practices and operating equipment to minimize the plant's energy/GHG footprint.

Wood - The low sulfur content of wood (0.007 to 0.08% by weight sulfur) minimizes SO_2 emissions

(b) Flue Gas Desulfurization –

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[6] ↑ Annual Energy Outlook 2002 with Projections to 2020, US Department of Energy, January 2002

[7] Cleaning up Coal, U.S. Department of Energy

FGD systems currently in use for SO_2 abatement can be classified as wet and dry systems. Based on a review of the RBLC database and state permits, it was revealed that control technologies for SO_2 abatement have not been implemented for SAFs. However, FGD options which have been traditionally applied to utility boilers may be available to control SO_2 from the SAFs. Therefore, the application of these technologies to the SAFs will be examined further.

The suitability of gas absorption as a pollution control method is generally dependent on the following factors:

1) Availability of suitable solvent;

2) Required removal efficiency;

3) Pollutant concentration in the inlet vapor;

4) Capacity required for handling waste gas; and,

5) Recovery value of the pollutant(s) or the disposal cost of the spent solvent.

Gas absorbers are most widely used to remove water soluble inorganic contaminants from air streams with typical pollutant concentrations ranging from 250 to 10,000 ppmv.[8] The SO_2 concentration from the proposed SAFs has been estimated at 8 ppm. For FGD controls in general, the expected variability and low SO_2 concentrations in the gas stream are not amenable to FGD which is typically geared for high sulfur fuel combustion systems.

(1) Wet Scrubbing -- Wet scrubbers are regenerative processes which are designed to maximize contact between the exhaust gas and an absorbing liquid. The exhaust gas is scrubbed with a 5 - 15 percent slurry, comprised of lime (CaO) or limestone ($CaCO_3$) in suspension. The SO_2 in the exhaust gas reacts with the CaO or $CaCO_3$ to form calcium sulfite ($CaSO_3.2H_2O$) and calcium sulfate ($CaSO_4$). The scrubbing liquor is continuously recycled to the scrubbing tower after fresh lime or limestone has been added.

The types of scrubbers which can adequately disperse the scrubbing liquid include packed towers, plate or tray towers, spray chambers, and venturi scrubbers. In addition to calcium sulfite/sulfate, numerous other absorbents are available including sodium solutions and ammonia-based solutions[9].

There are various potential operating problems associated with the use of wet scrubbers. First, particulates are not acceptable in the operation of wet scrubbers because they would plug spray nozzles, packing, plates and trays. Thus, the scrubber would have to be located downstream of the SAFs baghouses. This would substantially increase the capital cost of the wet scrubber, which is typically two to three times more expensive than the capital cost for a dry scrubber. Wet scrubbers also require handling, treatment, and disposal of a sludge by-product. In this case, air emissions would be exchanged for a large-scale water pollution

[8] SO_2 and Acid Gas Controls, Sixth Edition, EPA/452/B-02-001

[9] SO_2 and Acid Gas Controls, Sixth Edition, EPA/452/B-02-001

problem. Treatment of wet scrubber wastes requires advanced wastewater treatment including frequent maintenance by an experienced operator. The SO_2 concentration will vary widely over the SAFs cycle which operates as a batch process. This will preclude efficient application of wet scrubbing. Thus, the wet scrubber option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(2) Spray Dryer Absorption (SDA) -- An alternative to wet scrubbing is a process known as dry scrubbing, or spray-dryer absorption (SDA). As in wet scrubbing, the gas-phase SO_2 is removed by intimate contact with a suitable absorbing solution. Typically, this may be a solution of sodium carbonate (Na_2CO_3) or slaked lime [$Ca(OH)_2$]. In SDA systems the solution is pumped to rotary atomizers, which create a spray of very fine droplets. The droplets mix with the incoming SO_2-laden exhaust gas in a very large chamber and subsequent absorption leads to the formation of sulfites and sulfates within the droplets. Almost simultaneously, the sensible heat of the exhaust gas which enters the chamber evaporates the water in the droplets, forming a dry powder before the gas leaves the spray dryer. The temperature of the desulfurized gas stream leaving the spray dryer is now approximately 30 - 50 °F above its dew point.

The exhaust gas from the SDA system contains a particulate mixture which includes reacted products. Typically, baghouses employing Teflon-coated fiberglass bags (to minimize bag corrosion) are utilized to collect the precipitated particulates.

The SDA process would not have many of the potential operating problems associated with the wet scrubbing systems. The SO_2 concentration will vary widely over the SAFs cycle. Thus, SDA dry scrubbing option is considered technically infeasible for this application and will be not be considered any further in this BACT analysis.

(3) Dry Sorbent Injection (DSI) -- This control option typically involves the injection of dry powders into either the furnace or post-furnace region of utility-sized boilers. This process was developed as a lower cost option to conventional FGD technology. Since the sorbent is injected directly into the exhaust gas stream, the mixing offered by the dry scrubber tower is not realized.

The dry sorbent injection process would not have many of the potential operating problems associated with the wet scrubbing systems. The SO_2 concentration will vary widely over the SAFs cycle. The injection dose of sorbent materials would be hard to control in order to match variability in SO_2 concentrations. Similar control systems are fraught with chronic operational problems with the sensors requiring frequent maintenance and calibration.

Thus, DSI dry scrubbing option is considered technically infeasible for this application and will be not be considered any further in this BACT analysis.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

All control alternatives identified in Step 2 were eliminated as not technically feasible for controlling SO_2 emissions from the silicon production operations, with the exception of lower sulfur charge and good operating combustion practices.

Step 4 – Evaluate the Most Effective Controls and Document Results

Lower sulfur charge and good operating combustion practices were the only technically feasible control option in controlling SO_2 emissions from the SAF.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to submerged electric arc furnaces at silicon production plants:

Facility/	Permit Date	Process	SO_2 Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	Coke which exceeds the 1.7 lb/million Btu maximum and 1.4 lb/million Btu consecutive three month average, sulfur in fuel limits of 6NYCRR, Part 225-1.2 (d) Table 2 for solid fuel, may be used in combination with coal in the furnace charge on a minimum 4:1 coal/coke ratio. Globe is required to demonstrate that when using coke with a sulfur content greater than the allowable limit in combination with coal, the sulfur dioxide emissions will not exceed a maximum 3.4 pounds of sulfur dioxide per million Btu heat input and an average 2.8 pounds of sulfur dioxide per million Btu heat input. No control	
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	SO_2: 94 lb/hr Capacity: 20 MW/hr SO_2: 4.95 lbs/MW	No control

Facility/	Permit Date	Process	SO_2 Limit	Add-On Controls
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	SO_2: 68.7 lb/hr Nominal Capacity: 2 tons/hr SO_2: 34.35 lbs/ton silicon	No controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	None	No controls

As shown in the above table, SO_2 emissions from SAFs are uncontrolled. None of the sources as reflected in the above table have proposed or successfully implemented any add-on control devices to control SO_2 emissions from SAFs operation.

MS Silicon is proposing the SO_2 BACT for the SAFs as follows:

- **Total SO_2 emissions from the SAF shall be limited to 52 lbs/ton (averaged over a 30-day period) of silicon produced; and**
- **Utilization of low sulfur content material, where technically feasible.**

BACT Analysis for SO_2 Emissions from Natural Gas Combustion (AA-202)

Natural Gas Combustion Sources – Includes the following:

- Ladle Pre-Heaters (4 – 10.0 MMBtu/hr): 0.10 tpy SO_2;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control SO_2 that is emitted at from small natural gas combustion units. See below table for summary of SO_2 BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	SO_2 BACT Limit	Controls
Lake Charles Cogeneration LLC LA-0231	06/22/09	BACT-PSD	34.20 MMBtu/hr Shift Reactor Startup Heater	0.0006 lb/MMBtu	Combustion of natural gas
Competitive Power Ventures MD-0040	11/12/08	BACT-PSD	1.70 MMBtu/hr Heater	No limit	Exclusive use natural gas with sulfur content not to exceed 2.0 gr/100 scf
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	13.30 MMBtu/hr Ladle Preheater and refractory drying	0.0006 lb/MMBtu	Combustion of natural gas
Thysenkrupp Steel and Stainless USA, LLC AL-0230	08/17/07	BACT PSD	33.40 MMBtu/hr Batch Annealing Furnaces	0.0006 lb/MMBtu	No control
Nucor Steel AR-0090	04/03/06	BACT-PSD	Ladle Dryer	0.0006 lb/MMBtu	No control
Republic Engineered Products, Inc OH-0303	08/30/05	LAER	14.5 MMBtu/hr Ladle Dryers/Preheaters	0.0006 lb/MMBtu	Use of natural gas with sulfur content less than 0.6 % by weight
Charter Steel OH-0276	06/10/04	BACT-PSD	10 MMBtu/hr Ladle Preheater and Dryer, 4 Units	0.0006 lb/MMBtu	No controls
Nucor Steel IN-0090	01/19/01	BACT-PSD	15 MMBtu/hr Ladle Preheaters	No limit	Combustion of natural gas or propane

As shown in the above table, no add-on controls are used for SO_2 from the small natural gas combustion equipment.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar small natural gas combustion devices use fuel specifications and good combustion practices for controlling SO_2 emissions. No similar sized natural gas combustion devices were identified add-on SO_2 controls as BACT.

Thus, BACT is defined as combustion of clean fuel and good combustion practices. For the natural gas combustion sources associated with the proposed Plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of SO_2 control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

Thus, BACT for SO_2 emissions from natural gas combustion equipment to be utilized at the plant is defined as:

- **SO_2 emission rate of 0.0006 lbs/MMBtu;**
- **Combustion of clean fuel; and**
- **Good combustion practices.**

BACT Analysis for SO_2 Emissions from Emergency Equipment (AA-501)

Emergency Equipment – Includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP each): 0.2 tpy SO_2

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control SO_2 that is emitted at from emergency equipment. See below table for summary of SO_2 BACT determinations from the RBLC database:

Step 2 - Technical Feasibility of SO_2 Control Alternatives

The emergency diesel generator will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of SO_2 emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control SO_2 emissions from the emergency equipment, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing SO_2 BACT determinations for diesel fired emergency equipment. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	SO_2 BACT Limit	Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	No limit	No controls Engines will fire ULSD fuel oil or propane and each will be limited to 500 hours per year of operation during emergencies.
Idaho Power Company ID-0018	6/25/10	Emergency Diesel Generator	No limit	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389	12/29/09	Emergency ULSD Generator	No limit	ULSD combustion, 500 hours of operation per year
Verenium (FL-0318)	12/10/09	Emergency generators	0.0015 % S	Comply with applicable provisions of 40 CFR 60, Subpart IIII
Lake Charles Cogeneration, LLC (LA-0231)	06/22/09	Emergency Diesel Power Generator Engines (1341 HP)	0.0100 lb/hr	Comply with 40 CFR 60 Subpart IIII
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	No limit	100 hours of operation per year, ULSD fuel, good combustion practices, EPA certified per NSPS IIII
		500 KW emergency generator	No limit	100 hours of operation per year, ULSD fuel, good combustion practices, EPA certified per NSPS IIII
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	0.89 lb/hr	Low sulfur diesel fuel < 0.05% S

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII; good combustion/operating practices, and the use of ultra-low sulfur diesel (ULSD) fuel.

Step 5 – Select BACT for SO_2 from Emergency Equipment

BACT for SO_2 emissions associated with the emergency equipment is proposed as compliance with NSPS IIII; good combustion/operating practices, and use of ULSD.

Best Available Control Technology (BACT) Analysis - Emissions of VOC

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of VOC emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes.

VOC Emission Sources Subject to Control Technology Evaluation

The VOC emission sources associated with the proposed plant that are included in this VOC BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces;
- Natural gas fired combustion equipment; and
- Emergency equipment.

For a summary of the estimated VOC emission rates for the sources identified above, please refer to the following table:

VOC Emission Rates for Sources Evaluated for BACT

Equipment Description	VOC Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnaces	92.5
Natural Gas Combustion Equipment • Ladle preheaters	0.9
Emergency Equipment: • Emergency Generator	0.08
Total	93.5

BACT Analysis for VOC Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The

following information resources were consulted in searching for the alternatives available for controlling emissions from the semi-enclosed submerged electric arc furnaces:

1. On-line USEPA Control Technology Database; and
2. State Air Quality Permits

The following control technologies were identified and evaluated to control VOC emissions from the SAFs:

(a) Operating Practice Modifications;

(b) Flaring of VOC Emissions;

(c) VOC Oxidation Catalysts;

(d) Post-Combustion Reaction Chamber;

(e) Catalytic Incineration; and

(f) Oxygen Injection.

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing VOC emissions from the SAF. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative. MS Silicon is also proposing to utilize a semi-enclosed SAF design that will reduce the quantity of VOC generated during the furnace conversion process. Because of the nature of the furnace process and temperatures that will be achieved during the process, engineering literature suggests VOC emissions will be minimal. For purposes of this application we have conservatively assumed VOCs will be generated and have assigned an emission factor expressed in lbs/ton.

(a) Operating Practice Modifications -- Due to marketplace demands on the type of products to be manufactured and the required product quality, MS Silicon does not propose any additional operating practice modifications that will alter VOC emissions from the existing SAF. Therefore, this control option will be eliminated for further evaluation in this BACT analysis.

(b) Flaring of VOC Emissions -- Based upon a review of the previously listed information resources, there is no known application of flaring SAF exhaust gases. Flaring of emissions for VOC destruction would require raising the exhaust gas temperature. Thus, based on the relatively large gas volumetric flow at a substantial temperature differential, the auxiliary fuel requirements needed to operate the flare would be overwhelmingly large. Additionally, it can be speculated as to whether the flare would actually result in a decrease of VOC emissions or increase thereof from supplemental fuel combustion, which would also result in an increase of NO_x emissions and potential CO_2 emissions. Consequently, this control alternative is considered technically infeasible for SAF exhausts and thus, will not be considered any further in this BACT analysis.

(c) VOC Oxidation Catalysts -- Based upon a review of the previously listed information resources, there is no known application of VOC oxidation catalysts to control VOC emissions from a SAF. The optimal working temperature range for VOC oxidation catalysts is approximately 850 °F - 1,100 °F with a minimum exhaust gas stream temperature of 500 °F for minimally acceptable VOC control. Exhaust gases from the SAF will undergo rapid cooling as they are ducted from the furnace.

Thus, the temperature will be far below the minimum 500 °F threshold for effective operation of VOC oxidation catalysts. Additionally, the particulate loading in the exhaust gas stream is anticipated to be too high for efficient operation of a VOC oxidation catalyst. Masking effects such as plugging and coating of the catalyst surface would almost certainly result in impractical maintenance requirements, and would significantly degrade the performance of the catalyst. Consequently, this control alternative is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(d) Post-Combustion Reaction Chambers -- Based upon a review of the previously listed information resources, there is no known successful application of duct burners or thermal incinerators to control VOC emissions from silicon production operations. The feasibility of these units to effectively reduce VOC emissions, without resulting in severe operational problems, is unknown. Further, such units are expected to consume large quantities of natural gas and oxygen; resulting in excessive annual operating costs.

The principle of destruction within post combustion chambers is to raise the SAF exhaust gases to a sufficiently high temperature and for a minimum amount of time to facilitate oxidation. The combustion chamber configuration must provide effective mixing within the chamber with an acceptable residence time. Recuperative heat exchangers can be used with these systems to recover a portion of the exiting exhaust gas heat and reduce the auxiliary fuel consumption.

The amount of VOC which could be oxidized with post combustion systems is uncertain, and precise performance guarantees are expected to be difficult to obtain from equipment manufacturers because of the lack of operating experience. In addition, there is the potential for additional emissions of NO_x and CO_2 from auxiliary fuel combustion. Further, due to the heat and particulate loading, the burners would have a short life expectancy, and may sustain severe maintenance and reliability problems. Additionally, a single or multiple duct burner system would not be able to heat the relatively cool gases from the SAF during cold cycling. Potentially, there are two locations where post combustion chambers can be installed, i.e., upstream or downstream of an SAF baghouse. Locating upstream of the baghouse would take advantage of slightly elevated temperatures in the exhaust gas stream. However, at this location, the post combustion chamber would be subject to high particulate loading. The units would be expected to foul frequently from the particulate accumulation, and the burners would have severe maintenance and reliability problems. Thus, the installation of the post combustion chamber upstream of the baghouse is considered technically infeasible. Alternatively, the post combustion chamber could be installed downstream of the SAF baghouse. However, even at this location, fouling due to particulate matter can occur and more importantly, even cooler exhaust temperatures would be encountered. These cooler temperatures would greatly increase the auxiliary fuel requirements. Further, the combustion of additional fuel will result in increases in emissions to the atmosphere.

Based upon the above discussions, the use of a post combustion chamber is considered technically infeasible for the silicon production operations and will not be considered any further in this BACT analysis.

(e) Catalytic Incineration -- Based upon a review of the previously listed information resources, there is no known application of catalytic incineration to control VOC emissions from silicon production operations. Catalytic incinerators use a bed of catalyst that facilitates the overall combustion of combustible gases. The catalyst increases the reaction rate and allows the conversion of CO to CO_2 at lower temperatures than a thermal incinerator. The catalyst is typically a porous

noble metal material which is supported in individual compartments within the unit. An auxiliary fuel-fired burner ahead of the bed heats the entering exhaust gases to 500 °F – 600 °F to maintain proper bed temperature. Recuperative heat exchangers are used to recover the exiting exhaust gas heat and reduce the auxiliary fuel consumption. Secondary energy recovery is typically 70 percent.

Catalytic incineration systems are limited in application due to potential poisoning, deactivation, and/or blinding of the catalyst. Lead, arsenic, vanadium, and phosphorus are generally considered poisons to catalysts and deactivate the available reaction sites on the catalyst surface. Particulate can also build up on the catalyst, effectively blocking the porous catalyst matrix and rendering the catalyst inactive. In cases of significant levels of poisoning compounds and particulate loading, catalyst replacement costs are significant.

As in the thermal incineration discussion, potentially, there are two locations where the incinerator can be installed, i.e., upstream or downstream of the SAF baghouse. For the same reasons discussed earlier (e.g., fouling due to particulate matter), the upstream location is considered technically infeasible. Alternatively, the incinerator can be installed downstream of the meltshop baghouse. However, even at this location, fouling due to particulate matter can occur, and further, the exhaust will be at a lower temperature. These cooler temperatures would greatly increase the auxiliary fuel requirements. The associated combustion of additional auxiliary fuel will result in an unacceptable increase in operating costs. Further, the combustion of additional fuel will result in increases in emissions to the atmosphere.

Due to the lack of application of catalytic incineration for SAFs and potentially adverse technology applicability issues, this control alternative is considered technically infeasible and will not be considered any further in this BACT analysis.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

All control alternatives identified in Step 2 were eliminated as not technically feasible for controlling VOC emissions from the SAF.

Step 4 – Evaluate the Most Effective Controls and Document Results

Good operating practices are only technically feasible control option in controlling VOC emissions from the SAF.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to submerged electric arc furnaces at silicon production plants:

Facility/ RBLC ID	Permit Date	Process	VOC Limit	Add-On Controls

Facility/ RBLC ID	Permit Date	Process	VOC Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	No limit	No control
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	VOC: 5.7 lb/hr Capacity: 20 MW/hr VOC: 0.29 lbs/MW	No control
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	VOC: 4.15 lb/hr Nominal Capacity: 2 tons/hr	No controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	None	No controls

As shown in the above table, VOC emissions from submerged electric arc furnaces are uncontrolled. None of the sources as reflected in the above table have proposed or successfully implemented any add-on control devices to control VOC emissions from SAF operation.

MS Silicon is proposing the BACT for VOC from the SAFs as follows:

- **Good operating practices; and**
- **Total VOC emissions from the SAF shall be limited to 2.4 lbs/ton (averaged over a 30-day period) of silicon produced.**

BACT Analysis for VOC Emissions from Natural Gas Combustion (AA-202)

Natural Gas Combustion Sources – Includes the following:

- Ladle Pre-Heaters (4 – 100 MMBtu/hr): 0.9 tpy VOC;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control VOC that is emitted in small quantities from each combustion unit. See below table for summary of VOC BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	VOC BACT Limit	Controls
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	Ladle Preheater and refractory drying	0.0055 lb/MMBtu (total)	Combustion of natural gas
Nucor Steel AR-0090	04-03/06	BACT-PSD	Ladle Dryer	0.0006 lb/MMBtu	Good combustion practice
Republic Engineered Products, Inc OH-0303	08030/05	LAER	Ladle Dryers/Preheaters	5.5 lb/mmscf	Best operational and engineering practices, good combustion practices
Charter Manufacturing Co. Inc. Charter Steel OH-0276	06/10/04	BACT-PSD	Ladle Preheater and Dryers	0.005 lb/MMBtu	No controls

As shown in the above table, no add-on controls are used for VOC control from the small natural gas combustion equipment at ferroalloy facilities.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling VOC emissions. No similar sized natural gas combustion devices were identified as using add-on VOC controls as BACT.

Thus, BACT is defined as combustion of clean fuel and good combustion practices. For the natural gas combustion sources associated with the proposed plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of VOC control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

BACT for the VOC emissions from small natural gas combustion devices to be used to support the silicon manufacturing processes is as follows:

- **Combustion of natural gas;**
- **Good operating practices; and**
- **Total VOC emission limit of 0.0055 lb/MMBtu (AP-42 Emission Factor).**

BACT Analysis for VOC Emissions from Emergency Equipment (AA-501)

Emergency Equipment – Includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP each): 0.27 tpy VOC.

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control VOC that is emitted at from each piece of emergency equipment. See below table for summary of VOC BACT determinations from the RBLC database:

Step 2 - Technical Feasibility of VOC Control Alternatives

The emergency diesel generator will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of VOC emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control VOC emissions from the emergency equipment, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing VOC BACT determinations for diesel fired emergency equipment. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	VOC BACT Limit	Add-On Controls
Idaho Power Company ID-0018	6/25/10	750 KW Emergency Diesel Generator	6.4 G/KW-H	Tier 2 Engine, Good combustion practices

Consumers Energy (MI-0389)	12/29/09	2000 KW Emergency ULSD Generator	6.4 G/KW-H	Engine design and operation
Verenium (FL-0318)	12/10/09	2000 KW Emergency generators	6.4 G/KW-H	The emergency generator and fire pumps are both an Emergency Stationary Compression Ignition Internal Combustion Engine (Stationary ICE) and shall comply with applicable provisions of 40 CFR 60, Subpart IIII
		Emergency ULSD Fired Pump	3.0 g/hp-hr	
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	1.55 lb/hr	Good combustion practices
		267 HP low sulfur diesel emergency fir pump	0.66 lbs/hr	Good combustion practices

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII and good combustion/operating practices

Step 5 – Select BACT for VOC from Emergency Equipment

BACT for VOC emissions from the emergency equipment is proposed as:

- **Compliance with NSPS IIII; and**
- **Good combustion/operating practices.**

IV. Permitted Emission Point Descriptions

Emission Point	Description
AA-000	**Silicon Manufacturing Plant**
AA-100	**Raw Material Receiving, Handling and Storage Operations**
AA-101	Material Handling and Transfer to and from Coal Storage Pile

Emission Point	Description
AA-101a	Conveyance of Coal to Charging Storage Silo equipped with 120,000 acfm Baghouse Control (BG5)
AA-102	Material Handling and Transfer to and from Wood Storage Pile
AA-102a	Conveyance of Wood to Charging Storage Silo equipped with Baghouse Control (BG5)
AA-102b	Wood Chipper
AA-103	Material Handling and Transfer to and from Quartz Storage Pile
AA-103a	Conveyance of Quartz to Charging Storage Silo equipped with Baghouse Control (BG5)
AA-104	Material Handling and Transfer to and from Limestone Storage Pile
AA-105	Storage Piles Processing (i.e., Bulldozing)
AA-106	Wind Erosion on Coal, Wood and Quartz Storage Piles
AA-200	**Silicon Manufacturing Plant**
AA-201	Four (4) Submerged Arc Furnaces equipped with individual negative pressure Baghouses (BG1, BG2, BG3, and BG4) for controlling emissions from the maximum production capacity of 2.75 tons/hour per furnace and 11.0 tons/hour utilizing all four furnaces and 21,024 tons/year per furnace and 84,096 tons/year utilizing all four furnaces.
AA-201a	Casting Frames
AA-202	Four (4) 10.0 MMBTU/Hr Natural Gas-Fired Ladle Preheaters (2 ton ladle capacity)
AA-300	**Product Refinement and Handling**
AA-301	Silicon Grinding and Milling Operations equipped with a Baghouse (BG6)
AA-400	**Other Plantwide Operations and Activities**

Emission Point	Description
AA-401	One (1) Oxygen Vertical Storage Tanks and One (1) Diesel Storage Tank Size?
AA-402	Plantwide Fugitive Emissions from Roadways
AA-402a	Plantwide Fugitive Emissions from Transport of Raw Materials (Material Storage Piles to SAF Charging Building)
AA-403	Slag Handling and Storage
AA-404	Silica Fume Silos
AA-405	Facility Wide Miscellaneous Operations subject to APC-S-6 *(Insignificant Activities)*
AA-500	**Emergency Support Equipment**
AA-501	One (1) 670 HP Diesel-Fired Emergency Generators

V. Summary of Permitted Emission Point Limitations, Requirements, and Applicability

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
AA-000 ***(Entire Facility)***	**Silicon Production**	**84,096 tpy**	**Determine the Production for each consecutive 12-month period**	**Maintain All Records and Submit a Semi-Annual Production Report for each consecutive 12-month period**
	Natural Gas	**350,000**	**Determine the total**	**Maintain Records and Submit**

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
	Combustion	MMBtu/yr	Combustion Rate	Semi-Annual Records of Usage Rate
	NOx	1,906.2 tpy	Determine the Emission Rate for each consecutive 12 month period	Maintain All Records and Submit Semi-annually to Demonstrate Compliance with consecutive 12-month period Individual and Combined Emission Limitations and/or Individual and Combined BACT Emission Limitation
	CO	1,444.3 tpy		
	SO2	2,170.1 tpy		
	VOC	93.5 tpy		
	PM/PM10	81.8 tpy		
	PM2.5	73.33 tpy		
	HAP	9.90 tpy (Single)		
		24.9 tpy (Combined)		
	Pretest Conference/ Protocol	-------	30-days prior to performance testing if requested by MDEQ upon 60 day advanced of Stack Test Protocol	Submit Results no later than 60 days following actual test
	Control Equipment	---------	Regular Maintenance shall be performed and kept in log form	--------
AA-101 *(Coal Storage Pile Material Handling)*	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier, reduced drop heights (where	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
		technically feasible), use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions		
	Material Throughput Rate	105,120 tpy	Determine the Material Throughput Rate for each consecutive 12 month period	Semi-Annual Report the Material Throughput Rate for each consecutive 12 month period
AA-101a (Coal Conveyance)	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM control	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan
AA-102 *(Wood Storage Pile Material Handling)*	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier (where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan
AA-102 *(Wood Storage Pile Material Handling)*	Material Throughput Rate	212,763 tpy	Determine the Material Throughput Rate for each consecutive 12 month period	Semi-Annual Report the Material Throughput Rate for each consecutive 12 month period
AA-102a (Wood	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for	Implement and Develop Dust Control Plan for	Submit Semi-annual Reports that the permittee is incompliance with the Dust

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
Conveyance)		PM control	demonstrating compliance with BACT	Control Plan
AA-102b *(Wood Chipper)*	PM/PM10/ PM2.5	BACT: Operation with an enclosure that will minimize fugitive emissions and limited hours of operation	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan
AA-103 *(Quartz Storage Pile Material Handling)*	PM/PM10/ PM2.5	BACT: Best Management Practices including a 3-sided windscreen barrier (where technically feasible), reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan
AA-103 *(Quartz Storage Pile Material Handling)*	Material Throughput Rate	212,763 tpy	Determine the Material Throughput Rate for each consecutive 12 month period	Semi-Annual Report the Material Throughput Rate for each consecutive 12 month period
AA-103a (Quartz Conveyance)	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM control	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
AA-104 ***(Limestone Storage Pile Material Handling)***	**PM/PM10/ PM2.5**	**BACT: Best Management Practices including a 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization, and/or watering to reduce visible emissions and the development of a fugitive dust control plan to minimize PM emissions**	**Implement and Develop Dust Control Plan for demonstrating compliance with BACT**	**Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan**
	Material Throughput Rate	**183 tpy**	**Determine the Material Throughput Rate for each consecutive 12 month period**	**Semi-Annual Report the Material Throughput Rate for each consecutive 12 month period**
AA-105 ***(Storage Piles Processing)***	**PM/PM10/ PM2.5**	**BACT: Development of Dust Control Plan including measures to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required**	**Implement and Develop Dust Control Plan for demonstrating compliance with BACT**	**Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan**
AA-106 ***(Storage Pile Wind Erosion)***	**PM/PM10/ PM2.5**	**BACT: Implementation of a Fugitive Dust Control Plan. Visible emissions shall be controlled using water, dust suppressants, or wind screens as needed.**	**Implement and Develop Dust Control Plan for demonstrating compliance with BACT**	**Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan**

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
AA-201 *(Submerged Arc Furnaces)*	PM/PM10/ PM2.5	BACT: 0.005 gr/dscf and use of fabric filter control (i.e., baghouse)	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	
	GHG (as CO2e)	BACT: 95,467 for each furnace and 381,866 tpy of CO2e f for all four Furnaces combined; Use of Semi-Enclosed Furnace; and Good Operation and Maintenance	Determine the CO2e Emission Rate for each consecutive 12 month period	
	NOx	BACT: 45.0 lbs/ton (averaged over a 3-hr period) of Silicon produced	Installation and Operation of CEMS	Submit Semi-annual Report of Emission from CEMs Data
	CO	BACT: 34.0 lbs/ton (averaged over a 3-hr period) of Silicon produced; Good Combustion and Operating Practices; Use of Semi-Enclosed Furnace		
AA-201 *(Submerged Arc Furnaces)*	SO2	BACT: 52.0 lbs/ton (averaged over a 3-hr period) of Silicon produced; and Utilization of Low Sulfur Content Material (where technically feasible)	Installation and Operation of CEMS	Submit Semi-annual Report of Emission from CEMs Data
AA-201 *(Submerged Arc Furnaces)*	VOC	BACT: 2.4 lbs/ton (averaged over a averaged over a	Initial Performance Testing for Developing Operational	Submit Semi-Annual Report of Emissions utilizing Data obtained from Operational Range Performance Testing

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
		24-hr period) of Silicon produced; and Good Operating Practices	Requirements	
	PM/PM10/ PM2.5	---------		
	PM	0.99 lb/MW-hr (compliance with 40 CFR 60, Subpart Z)	NSPS Subpart Z Requirements	
	CO	Less than 20 volume percent on a dry basis		
	Opacity	COMs Installation and Operation		
		15% from control device		
	Operating Limit	Only Two out of the Four Furnaces may be operated at any given time.	Requirements may be removed upon submittal of modeling to show compliance with NAAQS	
AA-201a *(Casting Frames)*	PM/PM10/ PM2.5	BACT: Best Management Practices to minimize the generation of fugitive particulate emissions	Utilize Best Management Practices for demonstrating compliance with BACT	--------
AA-202 *(Ladle Preheaters)*	NOx	BACT: 0.08 lbs/MMBTU; low NOx or equivalent burners/technology; combustion of clean fuel; and good combustion practices	Utilize Good Combustion Practices and Implement Maintenance Guidelines for demonstrating compliance with BACT	--------
	PM/PM10/	BACT: 0.0076 lbs/MMBTU;		

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
	PM2.5	Combustion of Natural Gas; and Good Combustion Practices		
	CO	BACT: 0.0840 lbs/MMBTU; Combustion of Natural Gas; and Good Combustion Practices		
	SO2	BACT: 0.0006 lbs/MMBtu; Combustion of Clean Fuel (i.e., Combustion of Natural Gas Only); and Good Combustion Practices		
	VOC	BACT: 0.0055lb/MMBtu; Combustion of Natural Gas; and Good Operating Practices		
AA-202 *(Ladle Preheaters)*	GHG	BACT: 117 lb/MMBTU of CO2	Determine the Emission Rate for each consecutive 12 month period	Maintain All Records and Submit Semi-annually to Demonstrate Compliance with consecutive 12-month period Individual and Combined Emission Limitations and/or Individual and Combined BACT Emission Limitation
		BACT: 0.0022lb/MMBtu of Methane;		
		BACT: 0.0002 lb/MMBtu of N2O		
		BACT: Good Combustion Practices, Combustion of Natural Gas Only, Periodic Maintenance, and Selection of the Most Energy		

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
		Efficient Burner Design		
AA-301 (Silicon Grinding and Milling)	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM control	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Maintain and Submit Semi-Annual Reports that the permittee is in compliance with the Dust Control Plan
AA-402 and AA-402a *(Unpaved and Paved Roads and Plantwide Trasnport Fugitive Emissions)*	PM/PM10/ PM2.5	BACT: Development of Dust Control Plan including measures to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan
AA-403 *(Slag Handling and Storage)*	PM/PM10/ PM2.5	BACT: 0.003 gr/dscf and use of Baghouse for PM control	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan
AA-404 *(Silica Fume Silo)*	PM/PM10/ PM2.5	BACT: 0.01 gr/dscf for PM10/PM2.5 and the use of Bin Vent Filter for PM Control	Implement and Develop Dust Control Plan for demonstrating compliance with BACT	Submit Semi-annual Reports that the permittee is incompliance with the Dust Control Plan
	Opacity	Dust Handling Equipment Emissions shall not exceed 10%	--------	--------
AA-501 *(Emergency Generators)*	PM/PM10/ PM2.5	BACT: Good Combustion and Operating Practices and Compliance with NSPS IIII	Implement Maintenance Guidelines for demonstrating compliance with BACT	Maintain and Submit Semi-Annual Reports of Emissions and Use of Low Sulfur Fuel Oil for each consecutive 12-month period
	CO			
	VOC			
	NOx	BACT: Good Combustion and		

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
	SO2	Operating Practices; Compliance with NSPS IIII; and Use of Ultra Low Sulfur Diesel (ULSD) fuel		
AA-501 *(Emergency Generators)*	NSPS Subpart IIII	Applicability	Monitoring and Compliance Requirements	
		Lifetime Requirements		
		Emission Standards		
		Diesel Fuel Requirements		
AA-000 *(Entire Facility)* *where applicable	CAM	Applicability	--------	--------
	NSPS Subpart Z	Applicability	--------	--------
	MACT Subpart YYYYYY	Applicability	--------	Initial Notification and Notification of Compliance Status Requirements
		Compliance Date (Upon Startup)		
		Emission Standards		
	MACT Subpart ZZZZ	Compliance via NSPS Subpart IIII	--------	--------
	Opacity	No more than 20%	--------	--------
AA-405	PM/PM10	0.6 lbs/MMBTU or as otherwise	--------	--------

Emission Point	Pollutant/ Parameter	Limit/Standard	Monitoring Requirement	Recordkeeping and/or Reporting Requirements
*(Insignificant Activities) *where applicable*		limited by facility modification restrictions		
		$E = 0.8808*I^{-0.1667}$ or as otherwise limited by facility modification restrictions.		
		0.2 grains/dscf of flue gas calculated to 12% CO_2 by volume		
	SO2	4.8 lbs/MMBTU per hour or as otherwise facility modification restrictions		

VI. Source Impact Analysis

The owner or operator of a proposed source or modification is required to demonstrate that allowable emission increases from the proposed source or modification, in conjunction with all other applicable emissions increases or reductions (including secondary emissions), will not cause or contribute to air pollution in violation of: 1) any national ambient air quality standard in any air quality control region; or 2) any applicable maximum allowable increase over the baseline concentration in any area.

The modeled concentrations used to determine compliance with any NAAQS and PSD increment depend on 1) the type of standard, i.e., deterministic or statistical, 2) the available length of record of meteorological data, and 3) the averaging time of the standard being analyzed. When the analysis is based on 5 years of National Weather Service meteorological data, the following estimates are used:

- For deterministically based standards (e.g., SO_2), the highest, second-highest short term estimate and the highest annual estimate; and
- For statistically based standards (e.g., PM_{10}), the highest, sixth-highest estimate and highest 5-year average estimate.

A. Existing Air Quality

Any application for a permit under the Prevention of Significant Deterioration program is required to contain an analysis of ambient air quality in the area that the major stationary

source or major modification would affect for each of the following pollutants: a) for the source, each pollutant that it would have the potential to emit in a significant amount; b) for the modification, each pollutant for which it would result in a significant net emissions increase.

The existing air quality is defined by the natural and human-generated sources of air pollution. The area surrounding the proposed Tishomingo County facility is considered rural and in attainment for all regulated pollutants. The pollutants under consideration in the analysis are particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), volatile organic compounds (VOC), and carbon monoxide (CO).

B. Modeling Procedure

All estimates of ambient concentrations are to be based upon applicable air quality models, data bases and other requirements specified in Appendix W of Title 40 of the Code of Federal Regulations (CFR) Part 51, *Guideline on Air Quality Models*.

The AMS/EPA Regulatory Model (AERMOD) version 12345 was used to estimate impacts from all pollutants. The modeling analysis was conducted using the regulatory default options. Building wake and downwash effects were accounted for using the Building Profile Input Program (BPIP) version 04274.

A total of eight (8) point sources, four (4) volume sources, and two (2) area sources related to the project were considered in the analysis. A description of the emission sources, the parameters, and the modeled emission rate are provided in Tables 1-3. Off-site sources were screened using the North Carolina 20D rule to determine if the sources could be considered to cause a significant concentration gradient in the vicinity of the proposed project. The full impact analysis included a total of ten (10) off-site sources (See Table 4 – Competing Source Inventory).

The hourly meteorological database used in the preliminary and full impact analysis consisted of five years (2007-2011) of Tupelo Regional Airport, Tupelo, MS surface data and Jackson-Evers International Airport, Jackson, MS upper air combined. This data was provided by the MDEQ and preprocessed using the AERMET meteorological preprocessor (Version 12345) for the AERMOD dispersion model.

A Cartesian receptor grid was used for the Screen modeling runs. The receptor grid was designed to ensure that the point of maximum ambient impact is identified and consisted of receptors extending to 50-km from the proposed plant site. Receptor spacing was as follows:

- 50-meter spacing along the site boundary.
- 100-meter spacing from the site boundary extending to 2-kilometers
- 200-meter spacing from 2-kilometers extending to 3-kilometers
- 500-meter spacing from 3-kilometers extending to 5-kilometers
- 1-kilometer spacing from 5-kilometers extending to 10-kilometers
- 2-kilometer spacing from 10-kiliometer extending to 20-kilometers
- 5-kilometer spacing from 20-kilometers extending to 50-kilometers

The total number of receptors in the grid was 3,484.

The receptor grid used for the refined modeling runs consisted of the subset of the receptors that were determined to be within the impact area determined by the screening modeling runs. Receptor coordinates, elevations, height above ground, and the hill height scales were produced using the AERMAP terrain preprocessor version 11103 for input to AERMOD. Maximum impacts were defined with 100-meter spacing.

Table 1 – MS Silicon Point Source Parameters

Emission Point		Stack Parameters				PM25 Emission Rate		PM10 Emission Rate		NO2 Emission Rate		SO2 Emission Rate		CO Emission Rate	
Emission Point Description	AERMOD Source ID	Stack height (meters)	Diameters (meters)	Velocity (m/sec)	Temp (°K)	(pph)	(g/sec)	(pph)	(g/sec)	(pph)	(g/sec)	(pph)	(g/s)	(pph)	(g/s)
4 Submerged Arc Furnaces w/ baghouses	SAF1	91.44	1.93	19.37	449.82	3.49	0.44	3.49	0.44	123.75	15.59	141.9	17.88	93.5	11.78
	SAF2	91.44	1.93	19.37	449.82	3.49	0.44	3.49	0.44	123.75	15.59	141.9	17.88	93.5	11.78
	SAR3	91.44	1.93	19.37	449.82	3.49	0.44	3.49	0.44	123.75	15.59	141.9	17.88	93.5	11.78
	SAF4	91.44	1.93	19.37	449.82	3.49	0.44	3.49	0.44	123.75	15.59	141.9	17.88	93.5	11.78
Raw Materials Baghouses	RM1	12.19	1.37	18.29	293.15	0.77	0.097	0.77	0.097						
	RM2	24.38	1.37	18.29	293.15	0.77	0.097	0.77	0.097						
Product Refinement & Handling Baghouses	PR1	12.19	1.07	18.29	293.15	0.39	0.049	0.39	0.049						
	PR2	24.38	1.07	18.29	293.15	0.77	0.097	0.39	0.049						

Table 2 – MS Silicon Volume Source Parameters

Emission Point		Stack Parameters			PM2.5 Emission Rate		PM10 Emission Rate		NO2 Emission Rate		SO2 Emission Rate		CO Emission Rate	
Emission Point Description	AERMOD Source ID	Release height (meters)	Initial Sigma Y (meters)	Initial Sigma Z (meters)	(pph)	(g/sec)	(pph)	(g/sec)	(pph)	(g/sec)	(pph)	(g/s)	(pph)	(g/s)
4 Natural gas-fired Ladle Preheaters	F1	20.01	1.37	18.29	0.010	0.00126	0.010	0.00126	1.6	0.20	0.012	0.0015	1.65	0.21
	F2	20.01	1.37	18.29	0.010	0.00126	0.010	0.00126	1.6	0.20	0.012	0.0015	1.65	0.21
Casting Frames	CF1	14.00	1.07	18.29	0.006	0.000756	0.006	0.000756						
	CF2	14.00	1.07	18.29	0.006	0.000756	0.006	0.000756						

Table 3 – MS Silicon Area Source Parameters

Emission Point		Stack Parameters				PM25 Emission Rate			PM10 Emission Rate		
Emission Point Description	AERMOD Source ID	Release height (meters)	X-DIM of Area (meters)	Y-DIM of Area (meters)	Total Area (m2)	(pph)	(g/sec)	(g/sec/m2)	(pph)	(g/sec)	(g/sec/m2)
PA-Process Area											
Process Area	PA	9.14	229.66	339.73	78,022.39	0.24	0.0308	3.95E-07	1.35	0.1706	2.19E-06
Material Handling		-	-	-	-	0.0616	0.0078	-	0.411	0.052	-
Slag to tie into Raw Material Baghouse		-	-	-	-	No Emissions from this source			No emissions from this source		
Silica Fume Silos		-	-	-	-	0.03	0.0038	-	0.03	0.0038	-
Vehicle Traffic		-	-	-	-	0.08447	0.0106	-	0.8447	0.106	-
Raw Material Transfer Vehicles		-	-	-	-	0.0685	0.0086	-	0.0685	0.0086	-
SP-Pile Storage Area											
Pile Storage Area	SP	9.14	166.03	105.72	17,552.69	0.1717	0.0216	1.23E-06	0.4866	0.0613	3.49E-06
Wood Chipper		-	-	-	-	0.04	5.04E-03	-	0.04	5.04E-03	-
Bulldozing		-	-	-	-	0.0464	5.85E-03	-	0.3896	4.91E-02	-
Storage Piles		-	-	-	-	0.0853	1.08E-02	-	0.05696	7.18E-03	-

Table 4 - Competing Source Inventory

Source Name	Pollutant Emissions Rates (TPY)			
	PM10	PM2.5	NO2	SO2
Columbia Gulf Transmission, Corinth Co	7.71	7.71	5304.7	1.97
Kingsford Manufacturing Company	176.64	176.54	328.48	75.17
Oil Dri Production Company	275.56	275.56	283.64	278.5
Tiffin Motorhomes Inc., Paint Facility	77.02	77.02	351.99	2.71
TVA Magnolia Combined Cycle	273.38	273.38	1009.19	71.14
Tennessee				
Packaging Corporation of America			1534.02	2400.59

Source Name	Pollutant Emissions Rates (TPY)			
	PM10	PM2.5	NO2	SO2
Alabama				
Cherokee Nitrogen Company			307.85	
TVA – Colbert			11122.00	
Texas Eastern Transmission-Barton Compression Station			171.00	
Wise Alloys Plant			375.87	44276.00

C. *Air Quality Monitoring Requirements*

The ambient air quality analysis is required to contain continuous air quality monitoring data gathered for purposes of determining whether emissions of that pollutant would cause or contribute to a violation of the standard or any maximum allowable increase. The source may be exempt from the preconstruction monitoring requirements if the air quality impacts are less than the monitoring de minimis concentrations.

Table 5 - Preconstruction de minimus levels.

Pollutant	Averaging Period	Monitoring de minimis Concentration (µg/m³)	Modeled Concentration (µg/m³)
PM_{10}	24-hour	10	**20.47**
$PM_{2.5}$	24-hour	4	**9.41**
SO_2	24-hour	13	**31.02**
NO_2	Annual	14	6.19
Ozone		VOC or NOx emission increase < 100 TPY	93.5 TPY VOC 1906.2 TPY NOx
CO	8-hour	575	63.0253
Lead	3-month avg	0.1	-
Fluorides	24-hour	0.25	-
Total Reduced Sulfur	1-hour	10	-
Hydrogen Sulfide	1-hour	0.2	-
Reduced Sulfur Compounds	1-hour	10	-

Preliminary analysis results show the impact of carbon monoxide to be below the monitoring de minimis concentrations. The preconstruction monitoring requirement for these pollutants is, therefore, waived. Existing ambient air monitoring for the remaining pollutants is being used in lieu of conducting preconstruction monitoring.

The preliminary impact assessment emissions of PM10, PM2.5, NO2, and SO2were predicted to have a significant impact. In lieu of conducting preconstruction ambient monitoring for this purpose

D. *PSD Preliminary Analysis Modeling Impacts*

In the preliminary analysis, only the significant increase in potential emissions of a pollutant from a proposed new source, or the significant net emission increase of a pollutant from a proposed modification is modeled. A full impact analysis for a particular pollutant is not required when emissions of that pollutant from a proposed source or modification would not increase ambient concentrations by more than prescribed significant ambient impact levels.

Table 6 summarizes the results of the preliminary analysis. The modeled results presented are the highest estimated concentration for averaging times of 24-hours or less and the highest annual average of the individual years for the annual averaging period.

Table 6 - Significant Impact Modeling Results

Pollutant	Averaging Period	Significant Impact Level (µg/m³)	Modeled Results[1] (µg/m³)	UTM X (KM)	UTM Y (KM)	Event (YYMMDDHH)
PM_{10}	**Annual**	1	**3.59**	379049.67	3852320.72	2011

Pollutant	Averaging Period	Significant Impact Level (µg/m³)	Modeled Results[1] (µg/m³)	UTM X (KM)	UTM Y (KM)	Event (YYMMDDHH)
	24-hour	5	**20.47**	378671.74	3852133.81	07100524
$PM_{2.5}$	**Annual**	0.3	**1.94**	378852.62	3852323.27	2007
	24-hour	1.2	**9.41**	378671.74	3852133.81	
SO_2	**Annual**	1	**4.79**	378965.00	3852720.00	2007
	24-hour	5	**31.02**	379665.00	3852020.00	09061724
	3-hour	25	**74.63**	379865.00	3852120.00	09122715
	1-hour	7.8	**128.49**	380665.00	3851820.00	09010612
NO_2	**Annual**	1	**6.19**	378886.76	3851765.89	2007
	1-hour	7.5	**119.77**	378935.83	3851765.00	
CO	**8-hour**	500	63.0253	378951.14	3852322.00	07122408
	1-hour	2,000	123.5153	378886.76	3851765.89	08052122

(1) Highest First High

Modeled results for carbon monoxide were less than the significant impact level for both the 1-hour and 8-hour averaging periods, therefore, no further analysis was required for these pollutants. Modeled results for PM_{10}, $PM_{2.5}$, SO_2, and NO_2 were greater than the significant impact levels; therefore, a full impact analysis was conducted on these pollutants.

Significant Impact Area (SIA)

If the modeled concentrations from the preliminary modeling analysis equal or exceed the applicable significant impact level, then a full impact analysis must be performed. The preliminary analysis is used to determine the Significant Impact Area (SIA). The SIA is a circular area with a radius that extends from the source to (1) the most distant point where the modeling predicts a significant ambient impact will occur, or (2) 50 kilometers, whichever is less. The SIA is determined for each averaging period for each pollutant with predicted concentrations equal to or greater than the significant impact level. The SIA used for the full impact analysis for a pollutant with more than one averaging period is the largest of the SIAs determined for that pollutant. The proposed project's significant impact area for NO2, PM10, PM2.5, and SO2 can be seen in Figures 1-4, respectively.

The minor source baseline date is the earliest date after the trigger date on which a complete PSD application for a major source or major source modification is received by the permit reviewing authority that results in a 1 ug/m^3 annual increase in the average annual concentration of the applicable pollutant. Mississippi Silicon, LLC, establishes the minor source baseline date in Tishomingo County for PM_{10}, $PM_{2.5}$, SO_2, and NOx. The PM_{10}, $PM_{2.5}$, SO_2, and NOx minor source baseline for each pollutant is October 10, 2013.

As can be seen in Figures Mississippi Silicon, LLC, is located near the borders of Tishomingo, Alcorn and Prentiss counties. The impact area for $PM_{2.5}$ extends into Alcorn and Prentiss counties, whereby, establishing the $PM_{2.5}$ minor source baseline date for those counties. The $PM_{2.5}$ minor source baseline date for Alcorn and Prentiss Counties is October 10, 2013. The impact area for SO2 extends into Prentiss County, whereby, establishing the SO_2 minor source baseline date for Prentiss County. The SO_2 minor source baseline date for Prentiss County is October 10, 2013.

Figure 1 - NO2 Significant Impact Area

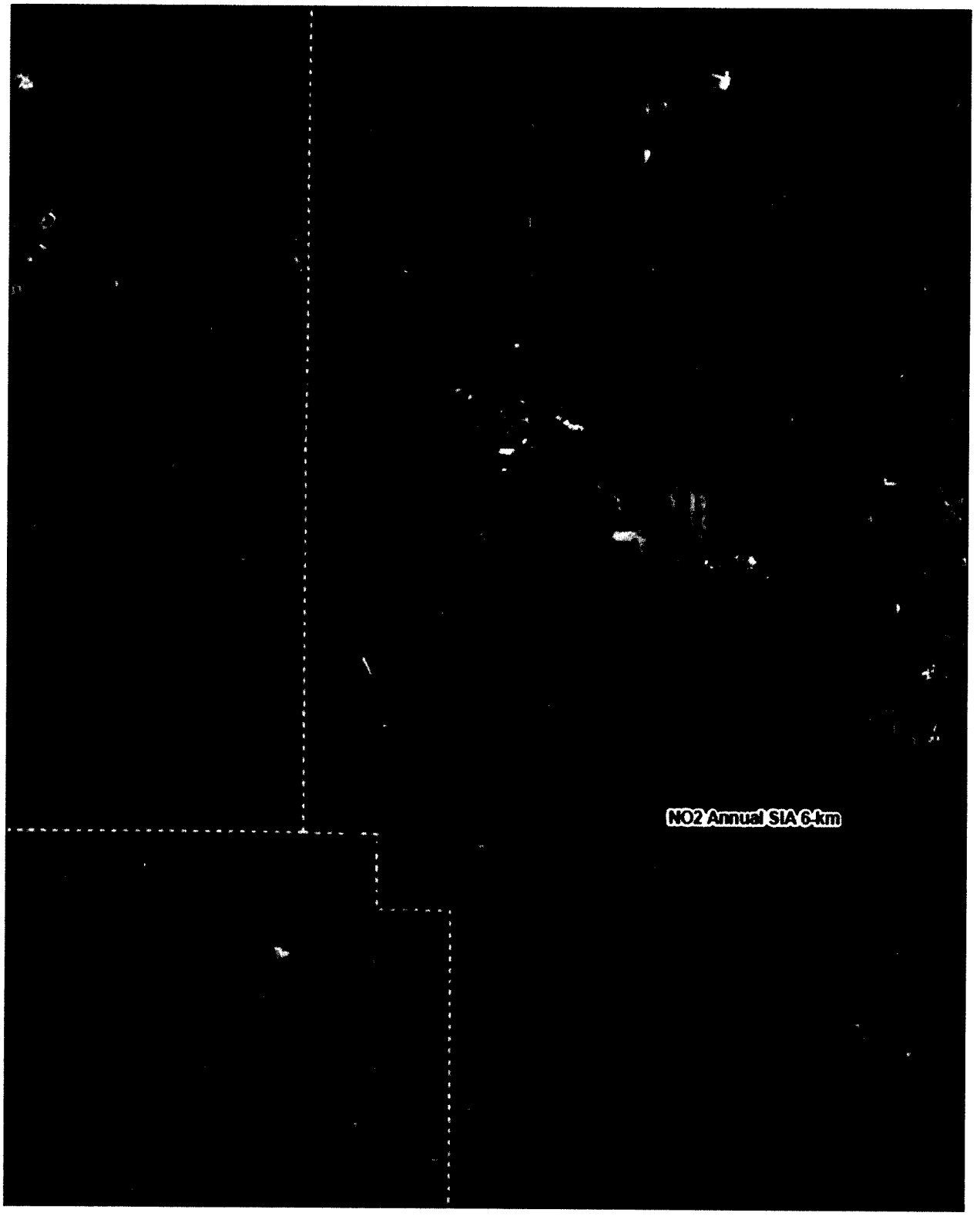


Figure 2 - PM10 Significant Impact Area

Figure 3 - PM2.5 Significant Impact Area

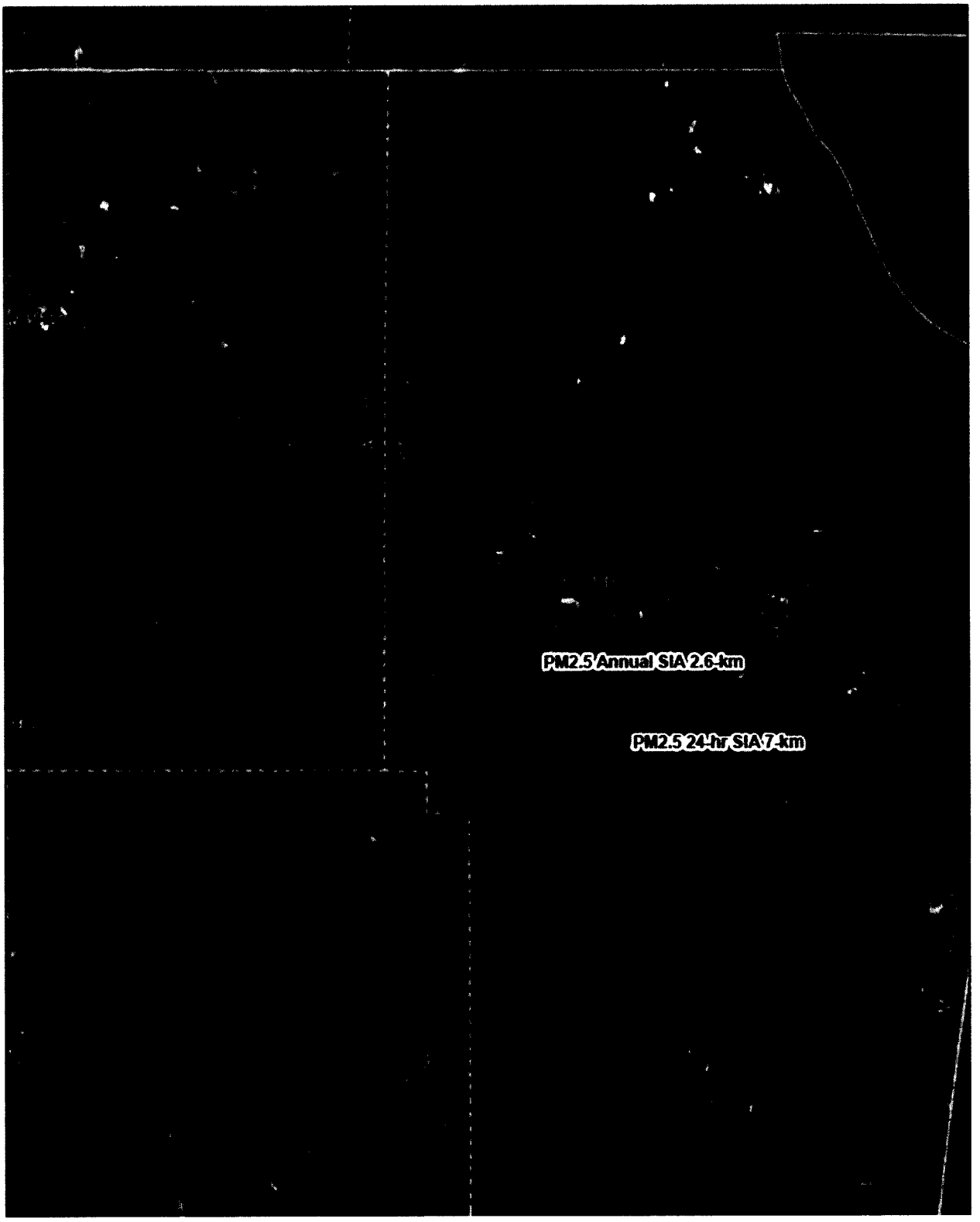
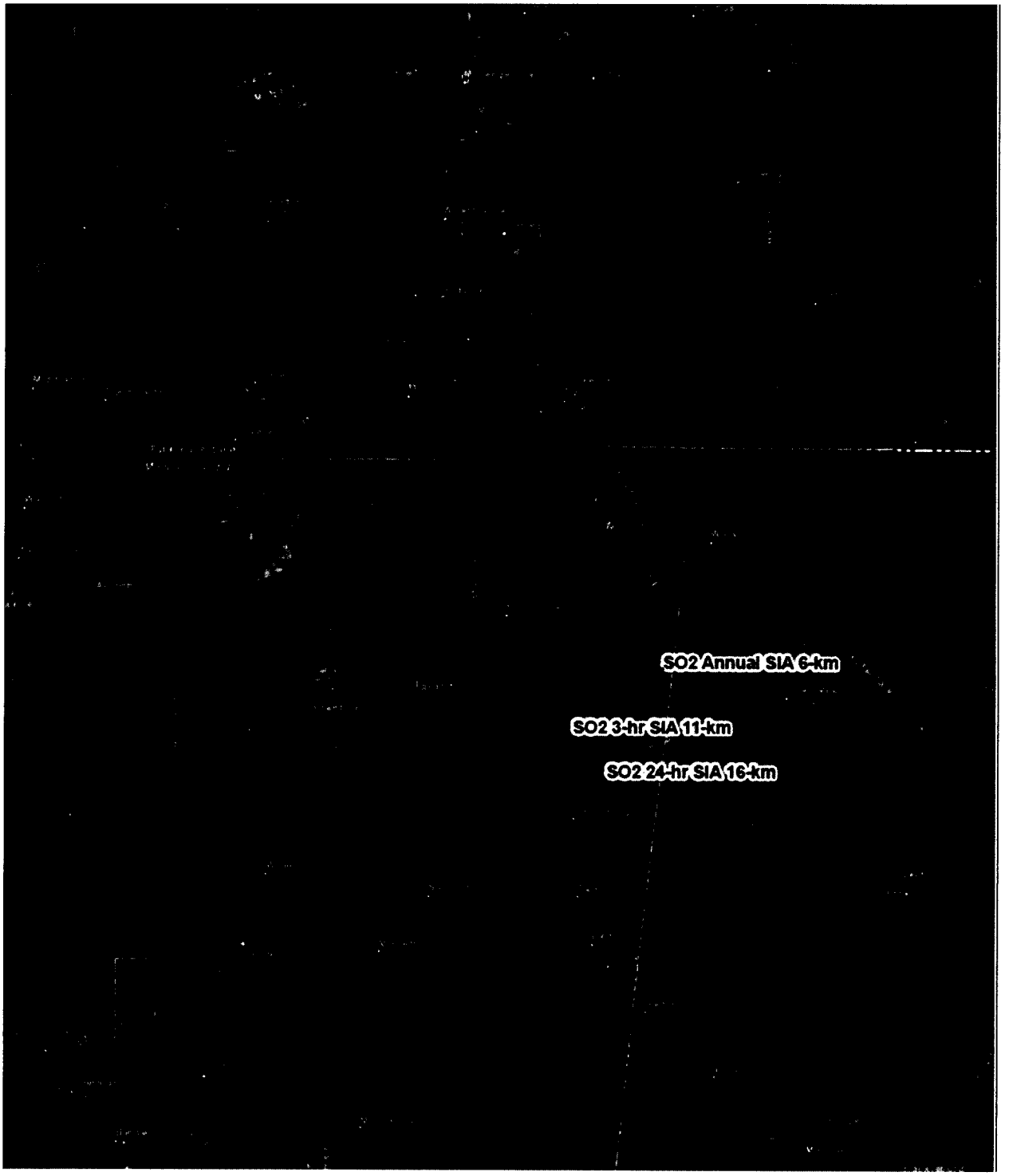


Figure 4 - SO2 Significant Impact Area



E. PSD Full Impact Analysis Modeling Impacts

A full impact analysis is required for any pollutant for which the proposed source's estimated ambient pollutant concentrations exceed prescribed significant ambient impact levels. This analysis expands the preliminary analysis in that it considers emissions from: the proposed source; existing sources; residential, commercial, and industrial growth that accompanies the new activity and the new source or modification. For SO_2, PM_{10}, Pm2.5 and NO_2, the full impact analysis actually consists of separate analyses for the NAAQS and PSD increments.

The impact area is a circular area with a radius extending from the source to (1) the most distant point where approved dispersion modeling predicts a significant ambient impact will occur, or (2) a modeling receptor distance of 50 km, whichever is less.

1. NAAQS

The NAAQS are maximum concentration "ceilings" measured in terms of the total concentration of a pollutant in the atmosphere. For a new or modified source, compliance with any NAAQS is based upon the total estimated air quality, which is the sum of the ambient estimates resulting from existing sources of air pollution and the modeled ambient impact caused by the applicant's proposed emissions increase and associated growth. The applicant is required, at a minimum, to explicitly model all nearby sources as part of the NAAQS analysis. The modeling guideline defines a "nearby" source as any point source expected to cause a significant concentration gradient in the vicinity of the proposed new source or modification. For PSD purposes, "vicinity" is defined as the impact area. The location of such nearby sources could be anywhere within the impact area or an annular area extending 50 kilometers beyond the impact area.

Compliance with the annual NAAQS was demonstrated as follows:

Table 7 - Modeled Form of the NAAQS by Averaging Periods

Pollutant	1-hour	3-hour	8-hour	24-hour	Annual
CO	H2H	-	H2H	-	-
NO_2	98th percentile of the daily max. 1-hour values	-	-	-	H1H
PM_{10}	-	-	-	H6H of the multiyear values	H1H
$PM_{2.5}$	-	-	-	98th percentile of daily max. 24-hour values	H1H
SO_2	99th percentile of the daily max. 1-hour values	H2H	-	H2H	H1H

The results of the NAAQS modeling are summarized in Table 88. Considering background with the modeled results, the facility was found to be in compliance with the NAAQS.

Table 8 - NAAQS Modeling Results

Pollutant	Averaging Period	NAAQS Standard (µg/m3)	Background (µg/m3)	Modeled Results (µg/m3)	Violation Predicted	UTM X (KM)	UTM Y (KM)	Event (yymmddhh)
$PM_{2.5}$	Annual	12	9.65	1.94	No	378852.62	3852323.27	N/A
	24-hour	35	18.5	6.62	No	378852.62	3852323.27	N/A

Pollutant	Averaging Period	NAAQS Standard (µg/m3)	Background (µg/m3)	Modeled Results (µg/m3)	Violation Predicted	UTM X (KM)	UTM Y (KM)	Event (yymmddhh)
PM_{10}	24-hour	150	46	14.04	No	378765.00	3851620.00	07080324
SO_2	Annual	80	5.7	2.03922	No	379265.00	3852820.00	
	24-hour	365	18.34	14.74566	No	379765.00	3852220.00	10061424
	3-hour	1300	70.7	43.29296	No	418965.00	3837020.00	09031412
	1-hour	196	70.7	76.42032	No	423965.00	3847020.00	09102810
NO_2	Annual	100	7.52	3.01115	No	378739.55	3851768.56	2010
	1-hour	**188**	**63.92**	**180.4108**	**Yes**	**372965.00**	**3866020.00**	

Culpability Analysis

The NO_2 1-hour average modeling predicted a modeled violation of the NAAQS in considering receptors where Mississippi Silicon had a significant impact under current EPA guidance. The model was reran to determine Mississippi Silicon's contribution to the modeled violations. The maximum contribution of the Mississippi Silicon project to a modeled violation of the 1-hour NO_2 standard was 5.5 ug/m^3. In considering a default NO_2:NO_x ratio of 0.8, the maximum contribution from the project to a modeled violation reduced to 4.4 ug/m^3. The maximum contribution of the project to a modeled violation was less than 58.7% of the SIL. Mississippi Silicon's contribution to modeled violations of the NAAQS is, therefore, considered insignificant and Mississippi Silicon does not cause or contribute to a violation of the NAAQS. Permitting can proceed for the project in regards to the modeled violation of the standard, however, the State must address the modeled 1-hour NO_2 violations through applicable provisions of the SIP.

2. Increment

A PSD increment is the maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant. The baseline concentration is defined for each pollutant and, in general, is the ambient concentration existing at the time that the first complete PSD permit application affecting the area is submitted. Emissions increases that consume a portion of the applicable increment are, in general, all those not accounted for in the baseline concentration and specifically include:

- Actual emissions increases occurring after the major source baseline date, which are associated with physical changes or changes in the method of operation at a major stationary source; and

- Actual emissions increases at any stationary source, area source, or mobile source occurring after the minor source baseline date.

Compliance with the PSD Increment was demonstrated using the highest (H1H) annual average over five years and the highest second high (H2H) for the short term averages. A comparison of the modeled results to the Class 2 increment can be seen in Table 99.

The maximum impacts due to increment consuming sources were found to be below the PSD Increment. Modeled values show the area to be in compliance with the $PM_{2.5}$, PM_{10}, SO_2, and NO_2 PSD increments for both the 24-hour and the annual averaging periods.

Table 9 - Increment Comparison

Pollutant	Averaging Period	Class 2 Increment (µg/m3)	Modeled Results (µg/m3)	UTM X (KM)	UTM Y (KM)	Event (yymmddhh)
$PM_{2.5}$	Annual	4	1.94	378852.62	3852323.27	2007
	24-hour	9	7.82	378810.99	3852298.80	
PM_{10}	Annual	17	3.59	379049.67	3852320.72	2011
	24-hour	30	16.68	378565.00	3851520.00	08092224
SO_2	Annual	20	4.79	378965.00	3852720.00	2007
	24-hour	91	26.02	379465.00	385162.00	09062024
	3-hour	512	67.24	378865.00	3851420.00	07081112
NO_2	Annual	25	6.19	378886.76	3851765.89	2007

F. Vegetation and Soils Impact

The owner or operator is required to provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of the source or modification. The owner or operator need not provide an analysis of the impact on vegetation having no significant commercial or recreational value.

The secondary NAAQS are set to "protect the public welfare from any known or anticipated adverse effects" associated with ambient concentrations of the pollutant. The term ``welfare" is defined in the Clean Air Act to include ``effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility, and climate." The modeled results were below the secondary NAAQS and, therefore, no adverse impact on soils and vegetation is anticipated.

The predicted impacts attributed to the proposed project were compared to the screening levels presented in the EPA guidance document, "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, soils, and Animals." The suggested screening concentration for exposure to ambient air concentrations of sulfur dioxide are presented in Table 10.

Table 10 - Screening Concentrations for Exposure to Ambient Air Concentrations

Pollutant	Averaging Period	Minimum Reported Level ($\mu g/m^3$) Vegetation Sensitivity		
		Sensitive	Intermediate	Resistant
NO_2	Annual	94-188		
	1-hr	917	-	-
SO_2	3-hr	786	2096	13100
	Annual	18		

The modeled results were below the secondary NAAQS and the suggested screening concentrations, therefore, no adverse impacts on soil and vegetation is anticipated.

G. *Associated Growth Impact*

The owner or operator is required to provide an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial and other growth associated with the source or modification.

H. *Class I Impact and Visibility*

The Federal Land Managers' Air Quality Related Values Work Group (FLAG), Phase I Report – Revised (2010), Section 3.2., Initial Screening Criteria (New), presents a size (Q/D, where Q is the total SO_2, NO_x, PM_{10}, and H_2SO_4 annual emissions divided by D, the distance from the Class I Area) criteria to screen out from Air Quality Related Values (AQRV) review those sources with relatively small amounts of emissions located a large distance from a Class I Area. If this value is less than or equal to 10, the source will be considered to have negligible impacts with respect to Class I AQRV. The Federal Land Manager (FLM) (and the Federal official with direct responsibility for management of the Federal Class I parks as wilderness areas) will not request any further Class I AQRV impact analysis. As a minimum, the permitting authority should notify the FLM of all sources that exceed the Q/D criteria.

Mississippi Silicon, LLC proposes annual potential emissions of:

SO2 2,170.1-tpy

NOx 1,906.2-tpy

PM10 81.6-tpy

H2SO4 0.021-tpy

Table 11 - Class I Area Q/D Screening Values

Class I Area	Distance (km)	Q/D	Agency	Agency Contact
Breton National Wildlife Refuge	530.33	7.84	Fish & Wildlife Service (FWS)	-
Caney Creek Wilderness Area	522.85	7.95	Forest Service (FS)	-
Mingo Wilderness	**292.52**	**14.21**	**Fish & Wildlife**	**CAPT Meredith Bond Deputy Chief**

Area			**Service (FWS)**	**(303) 914-3808 Meredith_bond@fws.gov**
Sipsey Wilderness Area	**90.92**	**45.73**	**Forest Service (FS)**	**Bill Jackson Air Resource Specialist (828) 257-4815 bjackson02@fs.fed.us**
Upper Buffalo Wilderness Area	397.58	10.45	Forest Service (FS)	-

The proposed location for Mississippi Silicon is less than 100 km from the nearest Class I Area and has an estimated Q/D screening value greater than 10 for each Class I Area within 300 km. Considering the distance from the Class I area, the magnitude of emissions, current conditions, potential impacts, etc., the FLM's for these Class I Areas have requested that an AQRV analysis be performed and a modeling protocol submitted.

To perform the Class I area analyses, the CALPUFF Modeling System (CALPUFF (Version 5.8), CALMET (Version 5.8), and CALPOST (Version 6.221)) which is the long range transport model recommended by the draft Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report - Revised (2010), was utilized.

The VISTAS CALMET dataset for Sub Domain 1 was utilized for the Sipsey Wilderness Area; sub Domain 3 was utilized for the Mingo Wilderness Area. The VISTAS CALMET dataset incorporated meteorological surface and upper air as well as precipitation stations which were provided to the CALMET model during processing. Monthly CALMET.DAT files were used for years 2001, 2002, and 2003. Ozone data were extracted using CalPro from a standard ozone dataset associated with the VISTAS CALMET dataset (Sub Domain 1 or 3).

The air dispersion modeling analysis evaluated the potential impact of emissions from the proposed silicon manufacturing plant. MS Silicon has committed to operating no more than two submerged arc furnaces at any given time. Emission data and source characteristic information for the proposed silicon manufacturing plant were provided by Kennedy/Jenks Consultants. Point, area, and volume sources were included in the model. Discrete receptors for Sipsey and Mingo Wilderness areas, downloaded from the National Park Service (NPS) web site at http://www.nature.nps.gov/air/maps/receptors/index.cfm were used to calculate air quality and visibility impacts.

The maximum concentrations of SO2, NO2, PM10, and PM2.5 at the Sipsey and Mingo Wilderness Areas were compared with Class I Significant Impact Levels (SILs).

Mingo Wilderness Area
Fish and Wildlife Services Class I Area
Class I AQRV Impact Analysis

Table 13 summarizes the Mississippi Silicon's significant impact modeling results for the Mingo Wilderness Area.

Regarding comments received from the FLM dated October 21, 2013, the Class I modeling report provided to the FLM mentioned in several places that the permit applicant, Mississippi Silicon, made a commitment to operate no more than two of its four submerged arc furnaces at any given time. (See section 2.1, third paragraph; section 2.2, third paragraph; section 3.3.1 narrative, and footnote to its accompanying Table 3-2.) Using the Q ~ 2,096.4 tons per year figure presented in section 2.2 for this

operating scenario, the resulting Q/d ratio for the Mingo Wilderness is reduced to approximately 7.2, below the FLAG 2010 screening threshold of 10.

Based on the revised operating scenario and the resultant emission rates, and the 293-km distance from the Mingo Wilderness Area, the project was screened from further AQRV review as regards the FWS-managed Mingo Wilderness Area results, No further FLM action is necessary.

Table 12 – Mingo Wilderness Significant Impact Modeling Results

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations (µg /m3)			SIL Class I Significant Impact Levels (µg /m³)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.0798	0.2387	0.1317	1.0	23.9
	3-hour (H2H)	0.0636	0.1173	0.0794	1.0	11.7
	24-hour (H1H)	0.0243	0.0563	0.0305	0.2	28.1
	24-hour (H2H)	0.0401	0.0313	0.0252	0.2	20.1
	Annual (H1H)	0.0006	0.0008	0.0008	0.1	0.85
NO_2	Annual (H1H)	0.0004	0.0002	0.0003	0.1	0.36
PM_{10}	24-hour (H1H)	0.0004	0.0011	0.0007	0.3	0.36
	24-hour (H2H)	0.0003	0.0006	0.0006	0.3	0.21
	Annual (H1H)	0.0000	0.0000	0.0000	0.2	0.01
$PM_{2.5}$	24-hour (H1H)	0.0012	0.0019	0.0020	0.07	2.9
	24-hour (H2H)	0.0010	0.0014	0.0019	0.07	2.7
	Annual (H1H)	0.0000	0.0000	0.0000	0.06	0.07

Sipsey Wilderness Area
Forest Services Class I Area
Class I AQRV and PSD Increment Analysis

Table 14 summarizes the Mississippi Silicon's significant impact modeling results for the Sipsey Wilderness Area. The Federal Land Manager and EPA Region 4 were provided a copy of the application, Class I Impact Analysis, and draft PSD permit for review and/or comment. The draft permit conditions are subject to change based on information received as a result of the FLM and EPA Region 4 review.

Table 13 – Sipsey Wilderness Significant Impact Modeling Results

Pollutant	Averaging Time	CALPUFF Maximum Modeled Concentrations ($\mu g/m^3$)			SIL Class I Significant Impact Levels ($\mu g/m^3$)	Maximum % of SIL
		2001	2002	2003		
SO_2	3-hour (H1H)	0.8775	0.5986	**1.2454**	1.0	**124.5**
	3-hour (H2H)	0.6231	0.5672	0.9001	1.0	90.0
	24-hour (H1H)	**0.2371**	0.1958	**0.2551**	0.2	**127.5**
	24-hour (H2H)	0.1548	0.1947	**0.2235**	0.2	**111.7**
	Annual (H1H)	0.0074	0.0082	0.0104	0.1	10.4
NO_2	Annual (H1H)	0.0050	0.0058	0.0070	0.1	7.0
PM_{10}	24-hour (H1H)	0.0071	0.0046	0.0044	0.3	2.4
	24-hour (H2H)	0.0050	0.0031	0.0041	0.3	1.7
	Annual (H1H)	0.0002	0.0002	0.0002	0.2	0.11
$PM_{2.5}$	24-hour (H1H)	0.0139	0.0077	0.0081	0.07	19.8
	24-hour (H2H)	0.0074	0.0074	0.0072	0.07	10.62
	Annual (H1H)	0.0004	0.0003	0.0004	0.06	0.73

VII. Recommendation

The staff of the Permit Board has developed the draft permit and preliminary determination based on information submitted to the Permit Board by the applicant. The staff of the Permit Board is soliciting all relative information pertaining to the proposed activity, including a 30 day public comment, EPA review, and FLM, to ensure that the final staff recommendation on the draft permit complies with all State and Federal regulations. The Public, EPA, and FLM review and comment on the draft permit and supporting documentation is an important element in the staff evaluation and resulting recommendation to the Permit Board. The draft permit conditions have been developed to ensure compliance with all State and Federal regulations but are subject to change based on information received as a result of public, EPA, and FLM participation.

Office Memorandum
Air Quality Modeling and Transportation Section

To: Heather Ceron

From: Stan Krivo

Date: 10 September 2013

Subject: Review Comments
Application for Prevention of Significant Deterioration (PSD) Air Permit
Mississippi Silicon Manufacturing Plant (15 August 2013)
Burnsville, MS

The following are my review comments on the air quality modeling impact assessment supporting the above noted PSD permit application for the proposed new silicon manufacturing plant to be located near the city of Burnsville, MS. The proposed plant will produce low-cost, high-quality silicon metal for existing and new customers in the global market. The plant will employ about 150 people when complete and have a maximum of 500 construction jobs during its construction.

The following comments include summaries and observations as well as items needing additional information and/or explanations - items identified by an asterisk. [Note: The review has not included modeling input/output files.]

*Plant Property – Figure 2-1 indicates the modeled property boundary is plant property that is assumed to be entirely fenced. Section 5.4 states the ambient air boundary as defined by features that preclude public access. Based on these statements, the air permit should include the requirement that the entire modeled property boundary be fenced.

Project Emissions – The following comments are associated with the project emission used in the impact assessment.
- The Section 2.0 provided estimates of emissions have not been reviewed (assumed part of APS review).
*- The emission estimates provided for the plant roads, material handling, and material storage include various control equipment and/or management practices (e.g., vehicle speed limit, sweeping, watering, etc.) to limit emissions. Control efficiencies associated with management practices vary dependent of the selected practice and how the practice is routinely incorporated. These efficiencies do not approach those of add-on control equipment unless the practice is incorporated in a frequent and determined fashion (e.g., frequent sweeping or watering, large volume of water, etc.). "Best management practices" (BMP) is indicated as the control method for bulldozing coal/wood/quarts storage areas (99%), vehicle road traffic (95%), vehicle transport of raw materials (50%), and wind erosion from the coal/wood/quarts/slag storage areas (50%), . The permit should specifically identify the best control practices to be used, as well the needed application techniques, for the activities assigned very high efficiency BMP (i.e., the bulldozing and vehicle road emissions).

*- The modeled emission rates are provided in Table 5-3. Confirmation is needed that these are the maximum allowable short-term (i.e., hourly) rates appropriate as permit limits. The emissions rates used for the annual impact assessment were not provided. The application referenced Tables 5-4, 5-5, and 5-6 containing the project emission inventories were not provided.

Recent Court Decision - PM2.5 SMC and SIL - The recent court decision concerning use of the PM2.5 significant monitoring concentration (SMC) and significant impact levels (SIL) as the basis for exemption from pre-construction air quality monitoring and cumulative NAAQS and PSD increment compliance modeling should be addressed.
*- The court has vacated and remanded the PM2.5 SIL. Project impacts less than the SIL cannot, by itself, be used as justification to eliminate cumulative NAAQS and PSD increment compliance modeling. Additional information should be provided to support a conclusion that the project's impacts would not cause or contribute to a NAAQS or PSD increment exceedance.
*- The court also vacated the PM2.5 SMC. Project impacts less than the SMC can no longer be used to exempt the project from pre-construction ambient air quality monitoring. If existing air quality observations are proposed in lieu of pre-construction monitoring, supporting information should be provided to demonstrate that existing ambient air quality data would provide representative or conservative ambient concentrations for the impact area.

*Regulatory AERMOD Model – The most recent regulatory AERMOD model is Version 12345. The most recent AERMAP model is also Version 12345. The use of an older version for this application should be explained.

Ambient Monitoring Data – The following comments are associated with the ambient monitoring data that are used for project specific background measurements.
- The existing air quality monitoring data selected for use in place of pre-construction monitoring is provided in Table 5-2. This table provides, for each pollutant, the monitored location, the measured background concentration, and the basis for the concentration.
*- Although the text indicates MDEQ has waived the ambient monitoring requirement, the reason the selected air quality measurements are appropriate and acceptable to satisfy the pre-construction monitoring requirement for each pollutant and averaging period are not be provided. The adequacy and appropriateness of the existing ambient air quality data should be included in the application (e.g., available monitoring data, reason for selected data, etc.).
*- Although the background PM10 measurements from Jackson-Hinds County were selected as representative, the selected representative data for PM2.5 measurements are from monitors in DeSoto and Grenada Counties. The reason different monitors were selected for PM measurements should be explained.
*- The SO_2 measurements for each averaging period are not available from the selected representative monitor. An explanation for the missing 3-hour and annual measurements should be provided.

* Ozone Assessment - The project PSD pollutants include VOC and NOx. The anticipated impacts of the project's VOC and NOx emissions on the ambient ozone levels should be address in the application.

*PSD Class I Area – The assessment of project impacts to PSD Class I areas were not included in the application. The project's impact assessment should address the Air Quality Related Values (AQRV) and PSD Class I increment for each Class I area within 200-300 km.

PSD Increment and NAAQS Compliance Modeling – The following comments are associated with the air quality impact modeling analyses.
*- The major source and minor source baseline dates associated with each receptor defines the emission sources and/or emission units that affect PSD increment.
*- The Mississippi Silicon PSD permit application is indicated to set the minor source baseline date for all the pollutants of concern in Tishomingo County. Therefore, this project's emissions are the only PSD increment consuming emissions for modeled receptors in Tishomingo County. If the receptor grid extends beyond Tishomingo County, the minor source baseline dates of the other counties should be used to define PSD increment effecting emissions for these counties.
*- The modeling receptor grid does not appear sufficient to properly determine controlling concentrations. Confirmation is need that all maximum concentrations, and all concentrations challenging the maximum concentration (e.g., greater than 90% of the maximum), were modeled with 100-m or less grid resolution. The indicated modeled receptor grid only had 100-m grid resolution within 2 km of the project modeled property boundary. The receptor grid resolution is applicable to modeling for the SIL assessment and NAAQS and PSD increment compliance modeling.
*- The tables containing the modeling results (i.e., Tables 5-4a through 5-4d) only provide maximum concentrations. The tables do not provide the maximum distance where the project impacts are equal to or greater than the SIL (i.e., significant impact area (SIA)). The application should provide pollutant/averaging period dependent receptor areas with modeled project impacts equal to or greater than SIL.
*- Table 5-4d providing "Predicted Concentrations Compared to NAAQS" is misleading because it only provides the sum of maximum modeled project impacts with the selected background concentration. The multisource NAAQS and PSD increment compliance modeling have not been provided.
*- Because the multisource cumulative NAAQS and PSD increment compliance modeling has not be performed, the Section 5.10 conclusion that "the proposed plant's emissions of regulated air pollutants will result in predicted concentrations below the NAAQS" is unsupported.
*- The lack of NAAQS compliance modeling prevents the proper assessment of soils and vegetation impacts. The screening target concentrations used for this assessment should be compared to ambient NAAQS compliance concentrations not on project only impacts.

Meteorological Data – The following comments are associated with the meteorological data used in the modeling assessment.

*- The meteorological data selected (i.e., Tupelo Regional Airport surface and Jackson upper air data) for use in this modeling assessment were indicated to be "considered representative of the project site". The bases for this statement should be provided.
*- The directional dependent land used characteristics for the meteorological site (i.e., Tupelo Regional Airport) and the project site should be considered in the representative assessment.

Additional Impact Analysis – The following comments are associated with Section 6.0 additional impacts associated with growth, visibility, vegetation, soils, and wildlife.
*- Visibility impacts in the vicinity of the project are of concern not those at the PSD Class I areas. Project visibility impacts in the project Class II area should be provided or assessed.
*- Because the project will employ 150 people and has the potential to catalyze significant economic development in the county and state, the reason project related commercial and residential growth is not expected should be provided or explained.
*- The screening target exposure concentrations provided in "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (EPA 450/2-81-078, December 12, 1980) should be considered in the soils and vegetation impact assessment. The NAAQS compliance modeling results (i.e., ambient air concentrations) should be used in this soils and vegetation impact assessment.

Please let me know if you have any questions.

Office Memorandum
Air Quality Modeling and Transportation Section

To: Heather Ceron
Katy Forney

From: Stan Krivo

Date: 18 November 2013

Subject: Additional Review Comments
Application for Prevention of Significant Deterioration (PSD) Air Permit (15 August 2013)
Mississippi Silicon Manufacturing Plant
Burnsville, MS

The following are my review comments on the air quality modeling impact assessment supporting the above noted PSD permit application for the proposed new silicon manufacturing plant to be located near the city of Burnsville, MS. The proposed plant will produce low-cost, high-quality silicon metal for existing and new customers in the global market. The plant will employ about 150 people when complete and have a maximum of 500 construction jobs during its construction.

The purpose of this memorandum is to provide review comments, issues, and concerns that should be considered by Mississippi Department of Environmental Quality (MDEQ) in issuing an air permit for this facility. Because two important supplemental studies were provided in late October 2013 and the public review period ends this week (22 November 2013), the following addresses the previously provided comments and our initial comments on more recent supplemental documents/transmittals associated with the air quality impact modeling supporting this application. The following is a list of the major documents and emails provided in support of this application.

Substantial Documents:
- Air Dispersion Modeling Protocol in Support of Proposed Silicon Manufacturing Facility in Tishomingo County, MS (5 July 2913)
- Application for PSD Air Permit (15 August 2013
- PSD Air Quality Analysis MS Silicon Plant Class I Impacts for Sipsey and Mingo Areas (Sent via 10/21/13 Steve Frey email)
- Executive Summary of impacts on Mingo and Sipsey Class I areas (9 October 2013)
- Summary of Steps Used in the Air Quality Impact Evaluation (October 2013)
- Response to Questions Raised by MDEQ/EPA Region V (2 October 2013 Letter to MDEQ)
- Response (#2) to Additional Questions Raised by MDEQ – Air Quality Evaluation (23 October 2013 Letter to MDEQ)
- Addendum #1 Multi-Source Air Quality Impact Evaluation (Criteria Air Pollutants (10 October 2013)
- Various emails providing explanations and additional updates
- Pre-Construction Review and Preliminary Determination of Approval for Mississippi Silicon LLC (21 October 2013)

[Note: The above documents/emails contain information that is, at times, contradictory. It is therefore difficult to construct a complete consistent air quality impact assessment record supporting this application. My comments and concerns were shared with MDEQ in a 15 November 2013 conference call.]

The original PSD permit application (dated 08/15/13) only contained air quality impact modeling of project emissions for significant impact assessment (SIL) - screening modeling. Because impacts to PSD Class I Areas were not provided, and the project screening modeling had concentrations greater than the SIL, subsequent modeling documents were prepared to address these required analyses (i.e., Class I Impacts for Sipsey and Mingo Areas and Addendum #1 Multi-Source Air Quality Impact Evaluation).

The following are a few the more significant general comments on the air quality impact assessments and supporting documents provided to date.
- Many of EPA's review comments and requested additional information provided in our 10 September 2013 email to MDEQ have not been adequately and completely addressed.
- Because of the lateness of the PSD Class I impact assessment (10/21/13) and PSD Class II multi-source compliance modeling (10/10/13) EPA has not had time to adequately review and provide comments to MDEQ. Our initial concerns on these additional impact modeling documents were verbally provided.
- The contrary modeling information (e.g., significant impact areas are indicated to be contained within Tishomingo County while MDEQ's Preliminary Determination indicates otherwise) that affect the impact assessments have not been resolved.
- The project impacts to the Sipsey Wilderness PSD Class I area are greater than the SO_2 SIL. These significant impacts generally indicate the need to perform cumulative PSD increment assessment or provided sufficient reason/demonstration why a cumulative PSD Class I area increment assessment is not needed. This issue should be resolved.
- The PSD Class II area NAAQS compliance modeling and documentation does not provide sufficient information and analyses to support the statement that the project will not cause or contribute to the modeled NAAQS exceedance.
- The PSD Class II area PSD increment compliance modeling and documentation also does not provide sufficient information and analyses to support the statement that the project will not cause or contribute to a PSD increment exceedance.

Based on the above indicated outstanding issues, it is suggested that MDEQ allow ample time to resolve these questions and issues before issuing the Mississippi Silicon facility air quality permit.

Please let me know if you have any questions.

12/12/14
Email to Jackie Evens MDEQ on 12/10/14

Second Attempt

Stanley Krivo, CCM, QEP
U.S. Environmental Protection Agency
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960
Phone: 404/562-9123
Fax: 404/562-9019

From: Krivo, Stan
Sent: Wednesday, December 10, 2014 7:49 AM
To: Jacqueline Evans - MS DEQ (Business Fax)
Subject: MS Silicon - Remaining Air Quality Modeling Issues

Jackie,

The following provides a follow up to Monday's (8 December) conference call on the MS Silicon remaining outstanding air quality impact assessment issues. This is provided to help clarify some of the concerns discussed in our call.

Our below comments, which following the original issues and questions provided in EPA's 14 July 2014 letter, summarizes our evaluation of MDEQ provided responses. Some of the original issues/concerns have been resolved (Identified by asterisk) but others remain unresolved.

I hope this helps in your effort to address the remaining concerns with the air quality modeling for the MS Silicon permit.
Thanks...sjk

EPA's Review Comments on MDEQ's 4 September 2014 Responses to MS Silicon Outstanding Air Quality Impact Assessment Questions from EPA

1) Exclusion of Fugitive and Volume Emission Sources

According to the November 22, 2013 "Addendum #2 Updated Air Quality Impact Evaluation (Criteria Air Pollutants)," MS Silicon eliminated fugitive emission and volume source emissions because it concluded that their maximum impacts will be close to or within the facilities property boundary. To allow assessment of the appropriateness of this elimination, MS Silicon must provide supporting quantitative information on the number, location, and magnitude of the emissions excluded from the cumulative air quality assessment (*e.g.,* inventory of the eliminate fugitive and volume sources).

EPA Comments

- MDEQ's response only addresses the fugitive and volume emission sources for the project (i.e., MS Silicon). This question concerns the other nearby sources included in the cumulative impact assessment.

2) Use of Actual Emissions

The MS Silicon modeling used allowable emissions **except for** the modeling relating to compliance with the one hour SO_2 NAAQS and the one hour NO_2 NAAQS in the November 2013 "Addendum #2 where actual emissions were used. The use of actual emissions in the cumulative NAAQS compliance modeling is not supported by past or current practice nor by 40 CFR Part 51, Appendix W. Please provide a detailed technical explanation why this modelling approach was accepted by MDEQ as appropriate and in accordance with the current regulations, guidance, and accepted practice.

<u>EPA Comments</u>

The following provides our issues with MDEQ's use of the following references as technical explanations why the use of actual emissions was an acceptable and appropriate procedure in accordance with current regulations, guidance, and accepted practice.

- Use the March 1989 Calcagni Memorandum
    - Appendix W regulations and guidance has been updated a number of times since 1989. Appendix W contains the current acceptable models and modeling procedures for air quality impact analyses supporting PSD permit applications. Calcagni's guidance would have been incorporated in Appendix W updates if applicable.
    - Calcagni's reference to the 1980 PSD Workshop Manual is superseded by the 1990 version
    - This memorandum contains specific requirements/limitations for appropriate use of actual emissions (i.e., Only applicable for annual and quarterly NAAQS and only with respect to annual operating factor, historical operating levels and/or operating factors will be representative of future conditions.). The appropriateness of these conditions have not been addressed or demonstrated.
    - The justification provided in the PSD permit application for use of actual emissions did not reference this memo.
    - There were no commitments from MEEQ or the applicant concerning the modeled actual emissions being representative of future emissions, to become future allowable emissions, or any commitments concerning the actual modeled emissions.
    - Modeled actual 1-hour actual emissions appear to be developed from a database having only actual annual TPY values. Therefore, the values modeled are not appropriate maximum hourly rates reflective of actual emission from the past 2-years of operation.
- EPA 05/01/11 Clarification Memorandum
    - Applicant determined the appropriate other nearby emission source to include in the cumulative modeling analysis. This Clarification Memorandum guidance concerning the use of professional judgment in the selection of other

emission sources was available so it must have been considered in the selection of other emission source.
    - This referenced memorandum is not applicable to justify the use of actual emissions.
    - The applicant did not reference this memorandum in the PSD permit application.
- Appendix W Table 8-1
    - The appropriate input emissions must take into consideration the NAAQS of concern; maximum daily 1-hour concentrations.
    - The footnote to Table 8-1 indicates this table provides input data requirements for SIP. Other input criteria may apply to new source review or PSD.
    - Table 8-2 title is "Point Source Model Emission Input Data for NAAQS Compliance in PSD Demonstrations." Section 8.1.2(i) states that Table 8-2 "NAAQS compliance demonstrations in PSD analysis should follow the emissions input data shown in Table 8-2". This table also contains a category of "Other Sources".
    - Modeled 1-hour actual emissions, developed from a database having only actual annual TPY values are not appropriate maximum hourly rates reflective of actual emission from the past 2-years operation.

3) Modeled Receptor Grid

Please confirm that all modeled controlling concentrations and/or concentration exceeding ambient standards, and concentrations challenging these concentrations (*e.g.*, greater than 90% of the values), have been modeled with 100-meter grid resolution. If this was not the case, please provide information showing the actual grid resolution and explain why this grid resolution is appropriate. Also, please provide an explanation of why the 100-meter grid resolution was not used and discuss any potential differences in outcome from the use of a different grid.

EPA Comments

- Based on technical judgment and previous modeling guidance, the receptor grid resolution that ensures the identification of the estimated highest concentration and/or all modeled NAASQ exceedances is one of 100-meters spacing. Therefore, either all modeling grids have resolutions of 100-m spacing or all maximum modeled impacts or those with concentrations challenging these concentrations (i.e. within 10% of the maximum concentration) should be modeled within grids of 100-m spacing.
- The response does not clearly indicate challenging concentrations in grids of larger spacing were considered in the modeled grid resolutions.

4) Plant roads, material handling and storage

Best management practice (BMP) are indicated as the method for controlling emissions from bulldozing storage areas, vehicle road traffic, vehicle transport of raw product, and wind erosion from coal/wood/quarts/slag storage. Please provide a detailed technical

justification for the selection of these unusually high control efficiencies for the BMPs which includes an explanation of how the control efficiencies will be reached.

EPA Comments

- The selected control efficiencies for these MS Silicon emission sources were at or above the highest provided in the published data – the reason for this question. Just stating good management practices is not sufficient justification for these high control efficiencies. The reason the highest control efficiencies are appropriate should be provided.

5) *$PM_{2.5}$ Impact Analysis

Please provide the technical basis for the assumption that the baghouse will capture a majority of the secondary $PM_{2.5}$ emissions (*i.e.,* nitrates and sulfates). Please note, that appropriate guidance for this evaluation is the "Guidance for $PM_{2.5}$ Permit Modeling", finalized in 2014. EPA does not believe that relying on EPA's 2010 $PM_{2.5}$ guidance for the assessment of secondary $PM_{2.5}$ emissions is appropriate. These are important considerations given the large project SO_2 and NO_2 emissions and a resulting $PM_{2.5}$ controlling concentration within 6% of the NAAQS concentration considering only direct emissions.

EPA Comments

- The responses to this question do not address the PSD application provided justification for not addressing secondary PM2.5 emissions: the assumption that the baghouse will capture a majority of the secondary emissions.
- The MDEQ provided 5 alternate analyses to supporting the fact that no secondary PM2.5 assessment was provided in the PSD permit application. The information provided in these alternate analyses contained in MDEQ's response may be sufficient to replace the provided assumption that the baghouse would capture these emissions. These supporting analyses were not provided in the application or MDEQ's Preliminary Determination for this permit application.

6) Two-Prong Culpability Contribution Analysis

To address the project's contribution to modeled NAAQS violations, a unique, two-prong procedure was used. The first prong consisted of modeling the project's impacts along a straight line from the project to the nearby source assumed to cause the violation. It was assumed that the maximum interaction between these sources would occur along the straight line path downwind of the other source with no consideration of real atmospheric conditions where plumes interact. The second prong, which is also addressed above in comment #2, is a cumulative NAAQS compliance assessment performed using actual emissions, rather than permit allowable emissions, for the facilities contributing most to the modeled violations. Please provide the technical basis for accepting this two-prong culpability approach used to demonstrate no significant project impact to all modeled NAAQS exceedances.

EPA Comments

- The second prong of the PSD application two-pong culpability analysis deals with the previous question on the use of actual emissions rather than allowables.
    - The actual maximum 1-hour emissions occurring during the most recent 2 years should be used. The 1-hour values modeled appear to have been developed from an actual tons per year database which would not yield maximum actual 1-hour emissions.
    - The use of "actual" SO_2 hourly emissions for the TVA Colbert facility in AL resolved all 1-hour SO_2 modeled NAAQS exceedances. Therefore, there were no modeled NAAQS violations so MS Silicon could not contribute to a modeled NAAQS exceedance.
    - Although the TVA Colbert facility's emissions are being reduced under some form of enforcement actions, the MS Silicon permit does not make some enforceable commitment for the plant's operation contingent on the Colbert plant's future emission rate or other operation.
    - Each source's modeled actual emissions should be those associated with future plant's operations. An enforceable permit commitment by these plants to the modeled emissions would make the use of current actual maximum 1-hour emissions acceptable.
- The first prong assesses the project's impact in a limited scenario of direct line (constant wind direction), center line plume concentrations downwind of a nearby emission source that is assumed to cause the modeled NAAQS exceedance.
    - Step 1 of this assessment just provides the maximum project ambient1-hour SO_2 and NO_2 concentrations compared to the NAAQS. This just demonstrates the project's emissions will not in themselves exceed the 1-hour NAAQS.
    - Step 2 compared the project's impact to the SIL. The significant impact area for the project 1-hour SO_2 and NO_2 concentrations was 50 kilometers.
    - Step 3 was the evaluation of the cumulative impacts from SO_2 and NO_2 emission sources including MS Silicon and nearby sources. This resulted in maximum 1-hour SO_2 and NO_2 concentrations much larger than the 1-hour NAAQS.
    - Use of "actual" 1-hour SO_2 emissions for the TVA Colbert plant resolved the SO_2 problem.
    - "Actual" 1-hour NO_2 emissions were used for both TVA Colbert and Columbia Gas Transmission plants with the operation of MS Silicon limited to 2 SAF units. In addition, the Tier 2 conversion factor (0.8) was also used. Modeling with these limitation still produced modeled 1-hour NO_2 NAAQS exceedances. An analysis determining the maximum concentration of two interacting sources was performed by placing receptors downwind of a source along a diagonal line between MS Silicon and the source. This is not a definitive assessment of MS Silicon's contribution to modeled exceedances unless all receptors with modeled exceedances are "downwind" of this source in this same direction.
    - The final modeling using MAXCOUNT option would be a definitive method of determining MS Silicon's contribution to all modeled violations. The input configuration for this run should be given (e.g., the emission sources,

emission rates, conversion factor, receptor grid used, etc.). [Note: Need to show that the project will not have a significant contribution to any modeled violation. Modeling should be performed including the final configuration of all emission sources (e.g., with actual emissions, etc.) including all receptors with 100-m resolution in area with modeled violations.]

7) Modeling Procedure for 1-Hour NO_2

The use of actual emissions (*see* EPA questions 2 and 6, above) for the two significant nearby facilities reduced the number of modeled NO_2 violations but MS Silicon significantly contributed to some of the remaining modeled violations. The applicant used an 8 step process to resolve MS Silicon's contribution to the modeled NO_2 violations but only for "critical" receptors, as described in the application. This process does not address significant contribution by MS Silicon to all model concentrations exceeding the NAAQS. Please provide the technical basis for the conclusion that there are no significant project contributions to any modelled concentration exceeding the NAAQS.

EPA Comments

- The response to this question referred to question 6. Therefore the comments associated with Question 6 are applicable to this question.

8) *Impacts to Soils and Vegetation

Given the modeled NAAQS violations for the 1-hour SO_2 and NO_2, the statement in Section 4.2 that the maximum predicted NO_2 ambient concentrations are below the ambient air quality standards is unsupported and inappropriate. The results of the NAAQS compliance modeling (*i.e.,* cumulative impacts) should be used for comparison to the target values in Tables 4-1. Please provide the technical basis for accepting the applicant's assessment of soils and vegetation impacts.

EPA Comments

- The provided response would answers this question if TVA Colbert SO_2 modeled emissions become enforceable.

9) * PSD Class II Visibility Assessment

The applicant did not include a visibility impairment assessment of the project's impact in the PSD Class II area (*i.e.,* project's impact area). Please provide the technical basis for the conclusion that this analysis was not needed for this project.

EPA Comments

- The provided response answers this question – no state or federal parks or airports within the significant impact area [Note: Visibility assessment VISCREEN should be based on maximum hourly emissions.]

10) * PSD Class I Area SIL Assessment

MS Silicon's PSD Class I area (Sipsey) SO_2 impact assessment was greater than the SIL. A cumulative impact assessment was not performed based on the applicant's statement that it was not aware of any other significant PSD increment consuming SO_2 source that would impact Sipsey. The basis for this statement was not provided. Please provide the steps taken to identify other significant PSD increment consuming SO_2 sources that could impact the Sipsey Wilderness Area. If sources are indeed identified, please provide a cumulative impact assessment or the technical basis for why an assessment is not needed.

EPA Comments

- The Alabama DEM 2010 assessment of the SO_2 increment consumption at Sipsey was provided to demonstrate that the PSD Class I increment will not be exceeded based on the estimated project impacts.
- If the 2010 Alabama DEM study is shown to be still applicable (i.e., no additional increment consumption since 2010), than the provided additional information would be acceptable.

Stanley Krivo, CCM, QEP
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Pre-Construction Review

and

Preliminary Determination

of Approval for

Mississippi Silicon LLC

Facility No. 2640-00060

Technical Review
by
Bonnie Morgan

Air Quality Analysis
By
Jacqueline Evans

October 21, 2013

I. General Information

Mississippi Silicon LLC, East of County Roads 210 and 365 in Burnsville, Mississippi, 38833 has submitted a complete air permit application for a Prevention of Significant Deterioration Construction Permit to Construct Air Emissions Equipment.

The latitude and longitude of the facility is 38°, 48', 21.4" and 88°, 19', 15.5", respectively. The emission points for the project are around this area.

The Standard Industrial Classification (SIC) Codes for the facility is 3339 for Primary Nonferrous Metals for the manufacturing of Silicon.

II. Description of Proposed Plant

MS Silicon is proposing the construction of a silicon manufacturing plant in Burnsville, Mississippi, which is located in Tishomingo County. The plant will consist of two (2) specific process areas:

- Silicon manufacturing; and
- Support operations.

The silicon manufacturing process will involve the mixing of quartz, coal, and wood in a semi-enclosed submerged arc furnace to produce 98% pure silicon. Further processing is performed to produce the 98% pure silicon in the form of an ingot or flake. The silicon manufacturing process will include the following operations with the potential to emit regulated air pollutants:

- Material handling and transfer to and from coal, wood and quartz storage piles;
- Storage yard for coal, wood and quartz storage piles;
- Wind erosion from coal, wood and quartz storage piles;
- Wood chipper (electric-fired);
- Casting frames;
- Raw material day bins with supporting baghouse(s);
- Four (4) semi-enclosed submerged arc furnaces (SAF) with four (4) baghouses;
- Four (4) ladle pre-heaters; and
- Product refining operations with supporting baghouse(s).

The silicon manufacturing process (i.e., the meltshop operations) will include melting, transferring and cooling operations. The raw material day bins, identified as emission group AA-101a, AA-102a and AA-103a, will be used to support the semi-enclosed submerged arc furnaces. The raw materials from the storage piles will be transferred to the raw material day bins before being loaded into the semi-enclosed submerged arc furnaces. Material will be mechanically (i.e., front end loaders or other types of equipment) moved to reclaim areas where the materials will be conveyed either underground or aboveground to the raw material day bins. The raw material day bins will then feed into one or more of the four (4) SAFs. The SAFs will then convert the coal, woodchips, and quartz into 98% pure silicon metal in molten form. Each SAF will be rated at approximately 25 megawatts per hour of input and will produce a design maximum of 2.75 tons of silicon per hour. The processes associated with producing the silicon will include raw material handling and silicon metal melting and tapping. Each SAF will be equipped with a baghouse for controlling PM emissions. Appropriate equipment will be installed on each SAF that will be used to duct furnace exhaust gases to the baghouse. These four (4) SAFs are identified as emission unit AA-201 and will produce 98-99% pure silicon metal. The submerged arc process is a reduction smelting operation. In the production of silicon metal, quartz is the raw material from which silicon is derived. Carbon is necessary as a reducing agent and is supplied by coal and woodchips and limestone is used as flux. Smelting in the SAF

is accomplished by conversion of electric energy to heat. An alternating current applied to the electrodes causes a current to flow through the charge from the electrode tips to the furnace hearth. This provides a reaction zone of temperature up to 3600 degrees F. To maintain a uniform electric load, electrode depth is continuously varied automatically, as required. At high temperatures in the reaction zone, the carbon sources react chemically with silicon dioxide gas to form carbon monoxide and silicon metal. Molten product from the SAFs will then be tapped from the SAF through a taphole located at the bottom of the SAF at hearth level. The molten metal and dross will flow from the taphole into a ladle. The ladle will be moved by a hoist to the casting process. The metal will be poured into low, flat pans that will provide rapid cooling of the molten metal. Fume and dust generated and captured throughout the production process including tapping will be controlled by the baghouses and then collected and reused or sold. The process will also include four (4) natural gas-fired ladle pre-heaters rated at 10.0 MMBtu/hr each, which will be used to provide additional heat for further processing of the molten silicon to silicon flakes. The natural gas-fired ladle pre-heaters are identified as emission unit AA-202. Due to the nature of this operation, potential emissions of criteria air pollutants including carbon monoxide (CO), nitrogen oxide (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC), particulate matter (PM) and greenhouse gases (primarily in the form of carbon dioxide (CO_2) may occur from a) smelting in the SAF; b) combustion of natural gas in the ladle pre-heaters; and c) material ladling and casting operations. Fume and dust generated and captured throughout this manufacturing process including tapping will be controlled by the baghouses which vents to a single exhaust stack associated with each SAF. The collected dust from the meltshop baghouses will then be collected and reused or sold. Four (4) baghouses will be used to capture and control PM emissions generated from the four (4) SAF operations. Good work practices will also be employed to minimize the release of regulated air pollutants f All of the emissions associated with natural gas combustion in the ladle pre-heater are considered fugitive in natural and will not be routed to a control device or through a stack. Each of the four (4) SAFs is considered a point source and will be controlled by its own baghouse. Each baghouse will have a stack with the following parameters:

- Stack Height – Approximately 300 feet above grade;
- Stack Diameter - 15 feet in diameter;
- Stack flow rate of 125,000 acfm; and
- Exhaust stack gas temperature of approximately 140 degrees F.

Silicon product refinement and handling occurs after the casting operations. After the metal has been cooled it will be crushed and sized to customer specifications. Any remaining undersized material will be re-melted during the casting process. The following emission units have been identified in the product refinement and handling operation (AA-301):

- AA-301 –Silicon grinding and milling operations.

The following plantwide operations and activities will support the entire plant and will also have the potential to emit regulated air pollutants. No further detail will be given regarding these activities since this information can be found in the application and is general and not necessarily unique to Mississippi Silicon :

- Tank farm;
- Fugitive emissions from roadways;
- Slag handling;
- Silica fume silos:
- Facility-wide miscellaneous operations; and

- Emergency generator.

PSD Project Description

The proposed silicon manufacturing plant will be constructed in two (2) phases (The planned two phases are not greater than 18 months). After completion of both phases, the manufacturing plant will have constructed four (4) semi-enclosed submerged arc furnaces (SAF) with a capacity of 2.75 tons/hr each (~45 MVA) to produce approximately 84,096 tons/year of 98-99% pure silicon metal. The proposed project will have the potential to emit regulated air pollutants in sufficient quantities (i.e., tons/year) to trigger the PSD regulations. Potential emission of regulated air pollutants at the conclusion of Phase II are summarized below:

Table 1. PSD Applicability

Pollutant	Potential to Emit Emissions Rate (TPY)	Significant Emission Rate (TPY)	PSD Review Required? (Yes/No)
PM	104.1	25	Yes
PM_{10}	81.6	15[1]	Yes
$PM_{2.5}$	73.1	10	Yes
NO_X[1,2]	1,906.2	40	Yes
SO_2[1]	2,170.1	40	Yes
VOC[2]	93.5	40	Yes
CO	1,444.3	100	Yes
Greenhouse Gases (CO2e)	402,396.76		Yes
Lead	0.01	0.6	No

[1] As of April 28, 2011, both NO_x and SO_2 are precursors for $PM_{2.5}$. Therefore, if NO_x or SO_2 exceed 40 TPY, the project is considered major for $PM_{2.5}$.

[2] Both NO_x and VOC are considered precursors for ozone with a significant emission rate of 40 TPY each.

The MDEQ is proposing through the draft permit to limit the facility to operating two out of four SAFs at any given time in the PSD Construction Permit in order to meet the NAAQS. Since construction is phased and operation is also phased, the permittee will be able to utilize the operation data actuals emissions to show compliance with the NAAQS standards and possibly use this data for future modeling analysis for demonstrating the use of operating all four furnaces at the source. The source is aware that this future action, due to its limiting nature in the proposed PSD Construction, would require a significant modification to allow for the operation of all four furnaces.

In summary, the following equipment, technology, or good work practices will be employed to limit emissions from the proposed project and can be found implemented in the table of emission point limitations and monitoring and recordkeeping/reporting requirements:

- A negative pressure baghouse will be installed to control particulate matter on the plant's Submerged Arc Furnaces (SAF) to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions. One negative pressure baghouse will be installed for each individual SAF;
- A baghouse(s) will be installed to control particulate matter from raw material handling to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions;
- A baghouse(s) will be installed to control particulate matter from product handling to reduce the potential quantity of $PM/PM_{10}/PM_{2.5}$ emissions;

- Utilization of natural gas as the primary combustion fuel in the ladle pre-heaters associated with the proposed plant. This is the cleanest burning fossil fuel and inherently reduces emissions of regulated air pollutants when compared to other fossil fuels such as coal and oil;
- Implementation of a Fugitive Dust Control Plan to minimize potential emissions of $PM/PM_{10}/PM_{2.5}$ from becoming airborne from various support operations associated with the plant (i.e., slag handling, raw material handling, paved and unpaved roadways);
- Installation of low NO_x burner technology or design on the plant's natural gas combustion devices to reduce potential emission of oxides of nitrogen (NO_x);
- Inclusion of bin vent filters on silica fume silos to reduce potential $PM/PM_{10}/PM_{2.5}$ emissions;
- Energy efficiency techniques to reduce the plant's overall potential for formation of greenhouse gas emissions (GHG);
- Implementation of testing, monitoring, recordkeeping and reporting requirements to ensure the plant will operate in compliance with applicable regulatory requirements and will not cause or contribute significantly to an exceedance of air quality standards developed by EPA to protect human health and welfare.

III. Best Available Control Technology (BACT) Analysis

The BACT requirement is defined as:

> *"an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."*

BACT by definition is the most effective control option which is technically feasible considering economic, energy, and other environmental impacts. Control options can be eliminated as BACT on a basis of technical, economic, energy, or environmental considerations. The determination of BACT follows a Top-Down approach. In the top-down approach, progressively less stringent control technologies are analyzed until a level of control considered BACT is reached on the basis of environmental, energy and economic impacts. The key steps in the Top-Down process are as follows:

STEP 1: Identify Available Control Technologies: For the source, emissions unit, activity, or process requiring BACT, identify and list all "available" emissions control options for each pollutant. Available control options are those control technologies and techniques with a practical potential for application to the source, emissions unit, activity, or process. In general, any control option in commercial use in the United States at the time the analysis is performed should be included on the list of available control options.

STEP 2: Eliminate Technically Infeasible Options: Considering site-specific factors and constraints, remove from the list compiled in STEP 1 all technically infeasible control options. A control option can be considered as technically infeasible if technical difficulties such as physical, chemical, or engineering constraints would preclude the successful use of the control option in the particular application in question.

For all control options eliminated, demonstration that a control option is technically infeasible should be clearly documented in the BACT Analysis and included with the BACT submittal.

STEP 3: Rank Remaining Control Technologies by Control Effectiveness: Rank and list all remaining control options in order of control effectiveness with the most effective control alternative at the top of the list. As noted above, the control technologies to be evaluated and ranked will apply to those associated with controlling emissions from similar emission sources.

STEP 4: Energy, Environmental, and Economic Considerations: Using the "Top Down" procedure specified below, control options may be eliminated as BACT candidates on the basis of energy, environmental, and economic impacts of the option. Energy impacts include but are not limited to energy efficiency impacts, fuel cycle efficiency considerations, and fuel availability. Environmental impacts include but are not limited to ground water and water impacts, solid and hazardous waste impacts, and air quality impacts from increases in emissions of other air pollutants that result from implementing the control option. Economic impacts include the sum of up-front capital cost and annual operation and maintenance costs of implementing the control option.

A control option may be eliminated as a BACT candidate on grounds of significant energy, environmental, or economic impacts. Rationale for eliminating a control option should be well documented and included in the analysis. Economic impacts should be evaluated by comparing the cost effectiveness of the control option with generally acceptable cost effectiveness ranges for control of the particular pollutant in question.

STEP 5: Documentation: Include with the analysis all information, calculations, assumptions, and data used in making the BACT determination.

Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

A. Best Available Control Technology (BACT) Analysis - Emissions of Greenhouse Gases (GHG)

This evaluation follows the guidance developed by USEPA during 2010 under the Tailoring Rule. Under this rule, any project occurring after July 1, 2011 and having a net increase of equal to or greater than 75,000 tons/year of CO_2 on an equivalence basis triggers a BACT evaluation. As defined in USEPA's document entitled "PSD and Title V Permitting Guidance for Greenhouse Gases", dated March 2011, the BACT evaluation process is required to include five (5) steps. These steps are essentially those steps that make up the Top-Down evaluation process.

This BACT evaluation focused on the control technologies that have been demonstrated and commercially available for equipment associated with silicon production. Because of the importance of controlling GHG emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of GHG will be controlled to the levels specified. Technologies or concepts for controlling GHG emissions are and will continue to emerge on paper and on a trial basis. Since these technologies have not been proven to be reliable (i.e., demonstrated technologies), evaluation of these technologies are not being addressed in this BACT evaluation. MS Silicon is very reluctant to install a non-proven technology that may require significant on-site adjustments, while at the same time not meeting required GHG emission limits.

GHG Emission Sources Subject to Control Technology Evaluation

The following GHG emission sources are present at silicon manufacturing operations:

- Semi-Enclosed Submerged Arc Furnaces (AA-201);
- Natural Gas Combustion Equipment (AA-202); and
- Emergency Equipment (AA-501).

For a summary of the estimated GHG emission rates for the sources identified above, please refer to the following table.

GHG Emission Rates for Sources Evaluated for BACT

Equipment Description	GHG CO_2e Emission Rate (tons/year)
AA-201 - Semi-Enclosed Submerged Arc Furnaces (4 SAFs)	381,866
AA-202 - Natural Gas Combustion Equipment	20,499
AA-501 - Emergency Generator	32
TOTAL	402,397

BACT Analysis for GHG Emissions from Silicon Manufacturing

The production of ferroalloys results in emission of greenhouse gases. In ferroalloy production, raw ore, carbon materials and slag forming materials are mixed and heated to carbon sources. While CO_2 is the main greenhouse gas from ferroalloy production, recent research has shown that CH_4 and N_2O account for an equivalent greenhouse gas emission of up to 5 % of the CO_2 emissions from ferrosilicon (FeSi) and silicon-metal (Si-metal) production.

The most significant greenhouse gas (GHG) emissions are related to the generation of carbon dioxide during the chemical reactions occurring in the metallurgical furnaces, where carbon is used to reduce the quartz to silicon metal. The second source of CO_2 emissions in silicon metal production comes from the use of natural gas in combustion processes. **The use of emergency equipment is limited to 100 hours per year and generates an insignificant amount of GHG and thus will not be included in this BACT analysis.**

BACT Analysis for GHG Emissions from Semi-Enclosed Submerged Arc Furnaces (AA-201)

Step One - Identify Available GHG Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling GHG emissions from semi-enclosed submerged arc furnaces used in silicon production operations:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

Review of the above sources did not identify information on controlling GHG emissions from the semi-enclosed submerged arc furnaces used in silicon production processes. In electric arc furnaces, electrical resistance generates the heat required: the resistance in a SAF furnace is the atmosphere, while in a submerged-arc furnace the slag or charge forms the resistance. No control options for emissions from the SAF were identified in this review.

The possible control options that will be evaluated have been divided into two (2) distinct areas; 1) energy efficiency improvement options, and 2) add-on controls. The application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity. Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions. While energy efficiency can reduce emissions of all combustion-related emissions, it is a particularly important consideration for GHGs since the use of add-on controls to reduce GHG emissions is not as well advanced as it is for most combustion-derived pollutants.

Opportunities to further improve energy efficiency from electric arc furnaces in general are described below.

Control Measure	Description	Discussion
Improved Process Control	Process control can optimize operations and thereby significantly reduce electricity consumption. Control and monitoring systems for SAF are moving towards integration of real-time monitoring of process variables	This control measure is feasible and will be included in the SAF design.

Control Measure	Description	Discussion
Adjustable Speed Drives	As flue gas flow varies over time, adjustable speed drives offer opportunities to operate dust collection fans in a more energy efficient manner.	This control measure is feasible and will be included in the SAF design.
Transformer Efficiency—Ultra-High–Power Transformers	Ultra-high–power (UHP) transformers help to reduce energy loss and increase productivity. Location of the furnace transformers minimizing the length of the HV cables, less power losses.	This control measure is feasible and will be included in the SAF design.
Post-Combustion of the Flue Gases	Post-combustion is a process for utilizing the chemical energy in the CO and hydrogen evolving to heat the SAF ladle or to preheat other materials 570-1,470°F (300-800°C). It reduces electrical energy requirements and increases the productivity of the SAF.	This control measure is not applicable to the silicon metal production process. There are no post combustion processes for silicon metal. This control measure will be excluded from further consideration in this BACT analysis.
Direct Current Arc Furnace	The direct current (DC) arc furnace was pioneered in Europe, and these single-electrode furnaces have recently been commercialized in North America. The DC arc furnaces use DC rather than alternating current (AC). In a DC furnace one single electrode is used, and the bottom of the vessel serves as the anode. However, compared to new AC furnaces, the savings are limited.	This technology is feasible but the technology has been only tested on an experimental scale with poor results. Direct current arc furnaces have never been performed on a large scale for silicon metal production. This control measure will be excluded from further consideration in this BACT analysis.
Engineered Refractories	Refractories in SAF have to withstand extreme conditions such as temperatures over 2,900°F (1,600°C), oxidation, thermal shock, erosion and corrosion. Refractories can be provided by a controlled microstructure: alumina particles and mullite microballoons coated uniformly with carbon and carbides.	This control measure is feasible and will be included in the SAF design.

Control Measure	Description	Discussion
Airtight Operation	A large amount of air enters the SAF: around 1,000,000 ft^3 (30,000 m^3) in a standard SAF. This air is at ambient temperature, and the air's nitrogen and non-reactive oxygen are heated in the furnace and exit losses. The potential benefit for an industrial furnace with an airtight process including a post combustion practice and an efficient fume exhaust control are about 100 kWh/ton for an industrial furnace having a current electric consumption of 450 kWh/ton.	The furnace is semi-closed. In order to charge the furnace with the raw materials and place them in the proper position, the furnace doors will need to be open in order to "push the raw materials" using the "stoking machine" into place. Doors will be closed when not needed.
Flue Gas Monitoring and Control	The use of VSDs can reduce energy usage of the flue gas fans, which in turn reduces the losses in the flue gas.	This control measure is feasible and will be included in the SAF design.
Bottom Tapping	Bottom tapping leads to slag-free tapping, shorter tap-to-tap times, reduced refractory and electrode consumption, and improved ladle life	This control measure is feasible and will be included in the SAF design.
Carbon Capture and Storage	Carbon capture and storage involves separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 via pipeline, and finally injection and long-term geologic storage of the captured CO_2. Several different technologies, at varying stages of development, have the potential to separate and capture CO_2. Some have been demonstrated at the slip-stream or pilot-scale, while many others are still at the bench-top or laboratory stage of development	See below.

Step Two – Eliminate Technically Infeasible Control Options

All of the control options identified under Step 1 with the exception of Direct Current Arc Furnace, Post-Combustion of the Flue Gases, and Carbon Capture and Storage are technically feasible and were included in the BACT evaluation.

Carbon capture and sequestration (CCS) were not applied to SAFs in the past and has not been demonstrated in practice for these emission types. CCS is generally used for facilities with sources emitting CO_2 in large amounts, such as fossil fuel-fired power plants, and for industrial facilities with high-purity CO_2 streams.

CCS involves capturing CO_2, transporting it as necessary, and permanently storing it instead of releasing it into the atmosphere. The process involves three main steps:

- Capturing CO_2 at its source by separating it from other gases produced by an industrial process. Once CO_2 is separated and captured, it then can be compressed under high pressure for transport to an appropriate geological storage site;
- Transporting the captured CO_2 to a suitable storage location (typically in compressed form); and
- Storing the CO_2 away from the atmosphere for a long period of time, for instance in underground geological formations, in the deep ocean, or within certain mineral formations.

The process of transporting CO_2 is typically considered via pipeline and has substantial associated logistic hurdles and operational penalties. Transportation infrastructure issues include pipeline routing, acquisition of rights-of-way, and associated environmental impacts. In addition, additional energy must be expended to compress and transport the compressed CO_2. An alternative means of transporting the compressed CO_2 is via a ship, similar to transporting liquid natural gas. Again, there are similar logistic hurdles and operational penalties for transporting compressed CO_2 via ship that can be substantial.

Carbon sequestration usually involves the injection of CO_2 into deep geological formations of porous rock that are capped by one or more nonporous layers of rock. Injected at high pressure, the CO_2 exists as a liquid that flows through the porous rock to fill the voids. Saline formations, exhausted oil and gas fields, and unmineable coal seams are candidates for CO_2 storage. Also, CO_2 injected for enhanced oil recovery projects can result in long-term sequestration depending on the geologic conditions. Other schemes include liquid storage in the ocean, solid storage by reactions leading to the creation of carbonates, and terrestrial sequestration. This type of infrastructure does not exist at the proposed plant site.

Another important technical consideration is that carbon capture is simpler when CO_2 is produced in high purity and high concentration streams as the byproduct of certain industrial processes, such as natural gas processing, hydrogen production, and synthetic fuel production. In contrast, it is relatively more difficult to capture CO_2 from flue gas emissions, which may require the reengineering of certain established and reliable production techniques. Apart from the technical issues of cleaning such dirty gas streams so they are suitable for CCS, unlike power plants, where CO_2 concentrations are comparatively high and consistent, metallurgical operations have more dilute concentrations of CO_2, the off gas is dirty and difficult to handle, and CO_2 production varies widely depending on the process step.

In summary, CCS is excluded from this BACT evaluation for the following reasons:

- Installation and operate of CCS is not commercially available and has not been installed in conjunction with any SAF process installed and currently operating worldwide;
- Currently there is no infrastructure available at the project site that will allow MS Silicon the ability to capture it's CO_2 gas streams and pipe them to a nearby facility for further processing, such as a beverage plant;
- Currently there is no infrastructure available at the project site that will MS Silicon the ability to capture and store it's CO_2 gas stream for future use in the event a beverage plant would be installed in the vicinity of the proposed plant site;
- CO_2 produced at the proposed plant will require significant enhancements to improve its quality prior to being used by another source to produce a product; and

- Cost estimates are not being provided in support of removing CCS as a cost effective control alternative since EPA has not provided any guidance or established thresholds on what cost, expressed as a dollar per ton would be considered cost excessive.

Because of the various reasons provided above, MS Silicon is eliminating CCS has a viable control option for GHG control based on its 1) not being commercially available and 2) not being shown to be a proven control option that has been demonstrated in actual operation.

Based on the above technical issues, CCS is consequently deemed not technically feasible for controlling GHG emissions from the proposed SAFs.

Step Three – Assessment of Proposed BACT Emission Reduction Options

This step of the Top-Down analysis provides an assessment of the performance and feasibility of the emission reduction options evaluated. MS Silicon is proposing to utilize the newest generation of submerged arc furnace with inherently lower-emitting technologies, including energy efficiency measures. This new generation furnace is designed to more efficiently convert raw materials to the silicon intermediate product. It is almost impossible to evaluate each option defined above and establish a CO_2 percent reduction.

For purposes of this GHG BACT evaluation, MS Silicon has concluded that the new generation furnace is the most effective control at reducing GHG emissions.

Step - Four Evaluate Most Effective Control and Document Results

As discussed above, various emission reduction options (i.e., new generation furnace) are being proposed by MS Silicon that are considered the **Top Level** of emission reduction available for controlling GHG emissions from the production of silicon. Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

Step Five – Select BACT

A detailed review was conducted to determine the emission reduction options incorporated at other submerged arc furnaces. Review of recently permitted GHG sources and the RBLC database did not reveal BACT determinations for submerged arc furnaces.

BACT for GHG emissions from the semi-enclosed submerged arc furnace has been determined to be:

- **Utilization of a new generation furnace with inherently lower-emitting technologies and energy efficiency measures (i.e., semi-enclosed SAF);**
- **CO_2e emission limitation of 381,866 tons/year; and**
- **Good operation and maintenance to improve energy efficiency.**

A BACT Analysis for GHG Emissions from Natural Gas Combustion (AA-202)

The following natural gas combustion emission sources are included in this review:

Description	Heat Input (MMBTU/hr)	Heat Input (MMscf/year)	Total GHG Emissions (CO_2e) (tons/year)
Natural Gas fired Ladle Pre-Heaters – 4 Units – 10.0 MMBtu/hr each	40.0	350,00	20,499

Step One – Identify Available GHG Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling GHG emissions from natural gas combustion equipment:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

The application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity from combustion sources. Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions. Since GHG are the direct result of fuel combustion, any improvement in the efficiency of a process heater will reduce fuel use and GHG emissions. While energy efficiency can reduce emissions of all combustion-related emissions, it is a particularly important consideration for GHGs since the use of add-on controls to reduce GHG emissions is not as well advanced as it is for most combustion-derived pollutants.

Approaches for reducing GHG emissions from fossil fuel-fired equipment could include fuel switching or energy efficiency measures. In the case of natural gas-fired equipment, however, fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels commonly used.

Summary of Potentially Applicable GHG Energy Efficiency Measures – Natural Gas Combustion Sources

Control	Removal Effectiveness	Comments
Burner replacement	Replacing old burners with more efficient modern burners can lead to significant energy savings. Energy and cost savings vary widely based on the condition and efficiency of the burners being replaced.	• Energy efficient burners will be installed in the natural gas combustion equipment

Control	Removal Effectiveness	Comments
Boiler process control	Using a combination of CO and oxygen readings, it is possible to optimize the fuel/air mixture for high flame temperature (and thus the best energy efficiency) and lower air pollutant emissions	• Natural gas combustion equipment will optimize the fuel/air mixture for high flame temperature
Reduction of flue gas quantities	Excessive flue gas results from leaks in the boiler and/or in the flue. These leaks can reduce the heat transferred to the steam and increase pumping requirements. However, such leaks are often easily repaired, saving 2 to 5 percent of the energy formerly used by the boiler	• Equipment will be maintained to minimize any leaks
Reduction of excess air	Boilers must be fired with excess air to ensure complete combustion and to reduce the presence of CO in the unburned fuel in exhaust gases. When too much excess air is used to burn fuel, energy is wasted because excessive heat is transferred to the air rather than to the steam.	• Equipment will be maintained to ensure complete combustion
Carbon Capture and Storage	Carbon capture and storage involves separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 via pipeline, and finally injection and long-term geologic storage of the captured CO_2. Several different technologies, at varying stages of development, have the potential to separate and capture CO_2. Some have been demonstrated at the slip-stream or pilot-scale, while many others are still at the bench-top or laboratory stage of development	See below.

Step Two – Eliminate Technically Infeasible Control Options

With the exception of carbon capture and sequestration (CCS), all of the control options identified under Step 1 are technically feasible and will be included in this BACT evaluation. CCS was not evaluated in this BACT evaluation. This type of control technology has not been applied to natural gas combustion

sources in the past and has not been demonstrated in practice for these emission types. CCS is generally used for facilities with sources emitting CO_2 in large amounts, such as fossil fuel-fired power plants, and for industrial facilities with high-purity CO_2 streams. Based on this, CCS is consequently deemed not technically feasible for controlling the GHG emissions from the natural gas combustion sources that will support the proposed plant operations.

Thus, the available control options are as follows:

- Combustion of clean-burning fuel - Burners are designed to combust natural gas. Fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels commonly used;
- Energy efficiency pollution prevention options that are available for this type of combustion device include the following:
    - Burner efficiency;
    - Preventive Maintenance; and
    - Energy monitoring and management systems.

Step Three – Assessment of Proposed BACT Emission Reduction Options

This step of the Top-Down analysis provides an assessment of the performance and feasibility of the emission reduction options evaluated. Combustion of natural gas, low NO_x burners and good combustion practices and maintenance to improve energy efficiency are considered the top level of emission reduction available for the natural gas combustion equipment.

Step Four - Evaluate Most Effective Control and Document Results

The emission reduction options that are being proposed by MS Silicon that are considered the **Top Level** of emission reduction available for controlling GHG emissions from the combustion of natural gas. Since MS Silicon has selected the "Top-Level" of control or design with inherent control technique, taking into account any technical limitations, the BACT evaluation that follows does not address economic, energy and environmental impacts related to a specific control device. This follows EPA's suggested approach for performing this type of BACT evaluation.

Step Five - Select BACT

A detailed review was conducted to determine the emission reduction options incorporated at other natural gas fired burners. Review of the RACT/BACT/LAER Clearinghouse (RBLC) revealed the following BACT determinations for natural gas combustion equipment.

Facility/ RBLC ID	Permit Date	Basis	Process	GHG BACT Limit	Controls
Cargill, Inc. NE-0054 DRAFT DETERMINATION	3/1/13	BACT-PSD	300 MMBtu/hr Boiler	No Limit	Good combustion practice
Iowa Fertilizer Company IA-0105	10/26/12	BACT-PSD	472.4 MMBtu/hr Auxiliary Boiler	CO_2:117 lb/MMBtu Methane:0.0023 lb/MMBtu N_2O: 0.0006 lb/MMBtu	Good combustion practice
Iowa Fertilizer Company IA-0105	10/26/12	BACT-PSD	110.12 MMBtu/hr Startup Heater	CO_2:117 lb/MMBtu Methane:0.0023 lb/MMBtu N_2O: 0.0006 lb/MMBtu	Good combustion practice
Showa Denko Carbon, Inc. SC-0142	6/8/12	BACT-PSD	5 MMBtu natural gas fired hot oil heater	CO_2e: 3093 tpy	Good combustion practice, annual tune-up low NO_x burner
Port Dolphin Energy LLC FL-0330	12/1/11	BACT-PSD	Four 278 MMBtu/hr boilers	CO_2:117 lb/MMBtu	tuning, optimization, instrumentation and controls, insulation, and turbulent flow
Pyramax Ceramics, LLC GA-0147	2/8/12	BACT-PSD	9.8 MMBtu/hr natural gas fired boiler	CO_2e: 5809 tpy rolling average	Good Combustion Practices, design, and thermal insulation
Entergy Louisiana LLC, Nine Mile Point Electric Generating Plant LA-0254	08/16/11	BACT-PSD	Auxiliary Boiler 338 MMBtu/hr	CO_2:117 lb/MMBtu Methane:0.0022 lb/MMBtu N_2O: 0.0002 lb/MMBtu	Proper operation and good combustion practices

Summary of Potentially Applicable GHG Energy Efficiency Measures – Natural Gas Combustion Equipment

Control	Description	Comments
Use of Low Carbon Fuels	Burners will be combusting natural gas	• Burners are designed to combust natural gas. Fuel switching to a lower carbon fuel is not an option because natural gas emits less CO_2 per amount of heat derived than other gaseous or liquid fuels
Energy efficient processes and technologies	• Low NOx burners, • Good combustion practices to improve energy efficiency • Good maintenance of combustion equipment	• Burner design will incorporate low NOx burners and good combustion practices and maintenance to improve energy efficiency

Based on information reviewed for this BACT analysis, the GHG control measures focus on fuel type or energy efficiency measures. No other applicable GHG control measures were identified in this review. Provided below is a summary of the emission reduction options being incorporated into the natural gas fired combustion devices associated with the proposed silicon plant. Rationale for selection of BACT includes the use of natural gas as a clean burning fuel, use of low NO_x energy efficient burner technology and good combustion practice.

BACT for this emission unit is as follows:

- CO_2 – 117 lb/MMBtu
- Methane – 0.0022 lb/MMBtu
- N_2O – 0.0002 lb/MMBtu

Control techniques to be implemented to meet these emission limitations will be: 1) good combustion practices, 2) combustion of natural gas only, 3) selection of the most energy efficient burner design based on engineering selection process and 4) periodic maintenance.

Best Available Control Technology (BACT) Analysis - Emissions of $PM_{10}/PM_{2.5}$

Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. Particulate matter exists in the solid and liquid physical states, and gases or vapors may also condense to form particulate matter. The latter, condensable particulate matter, is of great concern due to the inherently small size of condensation products; overwhelmingly, condensable particulate can be classified as $PM_{2.5}$[1]. $PM_{2.5}$ is defined as particulate matter that has a diameter of 2.5 microns or less and is a subset of PM_{10} which is particulate with a size range of 10 microns or less. Even though both are particulate matter they have separate air quality standards and are considered separate pollutants for permitting purposes. The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. EPA groups particle pollution into two categories:

- "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.
- "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.[2]

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for the proposed silicon production plant. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of $PM_{10}/PM_{2.5}$ will be controlled to the levels specified. Condensable $PM_{2.5}$ emissions occur when gas molecules are present in the exhaust gas stream that when cooled change into a particulate state. This change from gas vapor to solid is referred to as condensable particulates. USEPA is involved in extensive research on trying to better define this change over, as well as how best to quantify the presence of these condensable particulates. For purposes of this evaluation, since no specific technologies exist (i.e., commercially available and demonstrated), above and beyond that already selected in the form of a baghouse, for controlling $PM_{2.5}$ emissions, additional emphasize was placed on the availability of controls to reduce emissions of SO_2 and NO_x. Emissions of SO_2 and NO_x can be present in the gas phase that could convert to solids in the form of sulfates and nitrates. USEPA has identified SO_2 and NO_x as potential precursors to the formation of $PM_{2.5}$ emissions. However, USEPA has not provided, as of the date of this application, guidance on the effect of SO_2 and NO_x as potential precursors to the formation of $PM_{2.5}$

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[1] Condensable Particulate Matter, Regulatory History and Proposed Policy, January 27, 1998 http://www.ncair.org/enf/sourcetest/cpm/condensweb.pdf

[2] http://www.epa.gov/air/particlepollution/

emissions. Subsequently, evaluation of the control options to reduce SO_2 and NO_x emissions to further reduce $PM_{2.5}$ emissions have not been included in this BACT evaluation.

$PM_{10}/PM_{2.5}$ Emission Sources Subject to Control Technology Evaluation

The $PM_{10}/PM_{2.5}$ emission sources associated with the proposed plant that are included in this $PM_{10}/PM_{2.5}$ BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces (SAFs) (AA-201);
- Casting Frames (AA-201a);
- Silica Fume Silos (AA-404);
- Natural Gas Fired Combustion Equipment (AA-202);
- Diesel Fired Emergency Generator (AA-501);
- Material storage and handling (AA-101, AA-101a, AA-102, AA-102a, AA-103, AA-103a, AA-104, AA-105, AA-106);
- Wood Chipper (AA-102b); and
- Roadways (AA-401, AA-402a).

For a summary of the estimated $PM_{10}/PM_{2.5}$ emission rates for the sources identified above, please refer to the following table:

$PM_{10}/PM_{2.5}$Emission Rates for Sources Evaluated for BACT

Equipment Description	PM_{10} Emission Rate (tons/year)	$PM_{2.5}$ Emission Rate (tons/year)
AA-201 - Semi-Enclosed Submerged Arc Furnaces (SAFs)	61.2	61.2
AA-201a- Casting Frames	0.3	0.3
AA-202 - Natural Gas Fired Ladle Preheaters	0.1	0.1
Diesel Fired Emergency Generator (AA-501)	0.001	0.001
Material Handling and Storage:		
• Material Transfer to and from Coal Storage Pile (AA-101)	0.01	0.002
• Material Transfer to and from Wood Storage Pile (AA-102)	0.002	0.0003

Equipment Description	PM_{10} Emission Rate (tons/year)	$PM_{2.5}$ Emission Rate (tons/year)
• Material Transfer to and from Quartz Storage Pile (AA-103)	1.8	0.3
• Limestone Material Handling (AA-104)	0.0008	0.0001
• Material Handling Area Baghouse (AA-101a, AA-102a, AA-103a)	6.8	6.8
• Product Handling Area Baghouse (AA-301)	3.4	3.4
• Storage Piles Processing (i.e., Bulldozing) (AA-105)	1.7	0.2
• Storage Piles Wind Erosion (AA-106, AA-403)	2.5	0.4
• Silica Fume Silos (AA-404)	0.15	0.15
AA-102b - Wood Chipper	0.042	0.042
AA-402 - In-Plant Gravel Roads	3.7	0.37
AA-402a - In-Plant Paved Roads	0.3	0.3
Total	**81.8**	**73.3**

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Semi-Enclosed Submerged Arc Furnaces

Step One - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling $PM_{10}/PM_{2.5}$ emissions from plant operations:

1. On-line USEPA Control Technology Database; and
2. State Air Quality Permits;

Particulate control technologies exist today that are proven and reliable that that provide a high level of removal efficiency (i.e., in excess of 99%). These technologies are well suited for controlling particulate matter, including $PM_{2.5}$ in the form of solids or "filterable" particulates. As will be described in the BACT evaluation that follows, MS Silicon is installing a fabric filter bag-house which is considered the top level of $PM_{10}/PM_{2.5}$ control technology for filterable particulates from the semi-enclosed submerged arc furnace. MS Silicon will also be using Best Management Practices to minimize the generation of $PM_{10}/PM_{2.5}$ fugitive emissions.

Technologies will continue to emerge for controlling particulate matter emissions, including $PM_{2.5}$ that are in the vapor phase in the exhaust gas and when cooled by ambient air at the point of the exhaust stack release, change from a vapor phase to a solid phase. This change over is defined as "condensable" particulates. As part of the BACT evaluation that follows we have examined proven technologies that can further reduce these precursors, thus reducing the condensable portion of $PM_{2.5}$ from the exhaust gas stream. Condensable $PM_{2.5}$ emissions should be minimal from the fugitive sources.

The choice of which technology is most appropriate for a specific application depends upon several factors, including particle size to be collected, particle loading, stack gas flow rate, stack gas physical characteristics (e.g., temperature, moisture content, presence of reactive materials), and desired collection efficiency. Emissions of particulate matter are generally controlled with add-on control equipment designed to capture the emissions prior to the time they are exhausted to the atmosphere. In cases where the material being emitted is organic, particulate matter may be controlled through a combustion process. The following control technologies were identified and evaluated to control $PM_{10}/PM_{2.5}$ emissions from the SAF:

(a) Electrostatic Precipitator (ESP) - In an ESP, particles are electrically charged and then exposed to an electric field in which they are attracted to an electrode. Periodically, this electrode is cleaned through vibration and the freed particles are directed into a collection unit. While ESPs have been used on solid fuel combustion devices they have not been used on similar sources as the proposed plant

(b) High Efficiency Cyclones - Cyclones and multicyclones are a commonly used PM control technology in the United States. A cyclone removes particles based the principle of gravity and centrifugal force. A multicyclone uses the same concept as a cyclone but employs multiple, smaller diameter cyclones to improve its capturing capacity. The particle control efficiency of both devices decreases as the particle size decreases and therefore do not adequately control $PM_{2.5}$.

(c) High Energy Scrubbers – High energy scrubbers are a wet scrubbing system that combines a high energy venturi scrubber with a cyclonic separator. These scrubbers are effective in the removal of dusts, fumes, vapors, and mists; as well as a variety of other air pollutants, and

(d) Fabric Filters (i.e., baghouses) - Fabric filters have been widely used for controlling PM emissions from many different types of sources. Large industrial, commercial, and Institutional (ICI) boilers are equipped with these devices and have PM control efficiencies of 99 percent or higher. A fabric filter, or baghouse, is made up of cloth or woven specialty fibers. The flue gases are directed through the filter. The separation efficiency of bag filters is quite high. Because of their design (large surface area of bags and longer residence times in transit), fabric filters may capture a higher fraction of ultrafine particles than ESPs

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull air from the SAF and push the dust laden air through the fabric filters and into the ambient air via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from SAF operations application due to their effectiveness. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for submerged arc furnaces or any other sources associated with the silicon production operations. Review of state permit information identified the following with respect to electric arc furnaces at silicon production plants:

Facility/	Permit Date	Process	PM_{10} Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009	11/26/10	Two submerged-arc semi-enclosed-type electric furnaces (22 MW/hr)	PM: 21.3 lb/hr per furnace (based on process weight rate calculation	Fabric filter (baghouse)
Globe Metallurgical Selma, AL 104-0001	9/10/10	20 MW Electric Arc Furnaces (2) producing silicon metal	0.99 lb/MW-hr 6.2 lb/hr	Baghouse
West Virginia Alloy, Inc. Alloy, West Virginia R30-01900001-2006	01/18/06	Electric submerged arc furnace No. 15 for the production of silicon metal and ferroalloys	PM10: 22.71 lb/hr	Baghouse with >99% control
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105	10/24/01	Electric Arc Furnaces (Ferrosilicon and Silicon metal production furnaces)	0.03 gr/dscf (filterable) or no visible particulate emissions, whichever is less stringent	Open roof Baghouse

As shown in the above table, PM emissions from submerged electric arc furnaces are controlled exclusively by baghouses and the BACT emission limits vary in how they are expressed. Because of the variations in the plant operations, it is very difficult to identify a consistent BACT emission limitation or permit limitation. For the $PM_{10}/PM_{2.5}$ emission sources associated with the SAFs at the proposed plant, a baghouse was the only control methods evaluated. The proposed BACT limit is at least as stringent as the permit limits presented in the table above.

Thus, BACT for $PM_{10}/PM_{2.5}$ emissions from the semi-enclosed submerged arc furnaces at the proposed plant is as follows:

- **Use of fabric filter control (i.e., baghouse); and**
- **$PM_{10}/PM_{2.5}$ – 0.005 grains per dry standard cubic foot (gr/dscf).**

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Casting Frames (AA-201a)

Molten product from the SAFs will be poured into low, flat pans that will provide rapid cooling and solidification of the molten metal. There is a potential for fume and dust to be generated during the casting process, however the amount of actual dust should be minimal.

Step One - Identify Available $PM/PM_{10}/PM_{2.5}$ Control Technologies

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. Potential PM control technologies are identified in the previous section.

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM/PM_{10}/PM_{2.5}$ emissions from the casting operations. The exhausting of casting emissions from a central canopy positioned over the casting installations to the SAF baghouse is neither practical nor economically feasible since it is too far away. In addition, the casting frame emissions in question are very low (< 1.0 tons/year) and can also be further minimized by the manner with which the unit is operated. The potential PM emissions are small and installation of a canopy and exhaust dust system is not very effective at capturing these small quantities of PM emissions. Thus, add-on controls are eliminated from further consideration in this BACT evaluation.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control option is best management practices.

Step 4 – Evaluate the Most Effective Controls and Document Results

Best management practices are the only effective control for this type of emission source.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse did not identify any BACT determinations for casting operations associated with the silicon production operations. Review of state permit information also did not identify BACT determinations for casting operations associated with the silicon production operations.

MS Silicon will be using Best Management Practices to minimize the generation of $PM/PM_{10}/PM_{2.5}$ fugitive emissions from the casting frame operation.

BACT for $PM/PM_{10}/PM_{2.5}$ for the casting frames (AA-201a) is proposed as:

- Best Management Practices to minimize the generation of $PM/PM_{10}/PM_{2.5}$ fugitive emissions from the casting frame operation; and
- No emission limit is being proposed since there is no formal method for quantifying emissions from this type of indoor operation.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Natural Gas Combustion (AA-202)

Because natural gas is a gaseous fuel, filterable PM emissions from combustion are typically low. Particulate matter from natural gas combustion has been estimated to be less than 1 micrometer in size and has filterable and condensable fractions. Particulate matter from natural gas combustion is usually larger molecular weight hydrocarbons that are not fully combusted. Increased PM emissions may result from poor air/fuel mixing or maintenance problems[3].

Natural Gas Combustion Sources – Includes the following:

- AA-202: Ladle Pre-Heaters (Four 10 MMBtu/hr): 0.1 tpy $PM_{10}/PM_{2.5}$;

Step 1 – Identify Control Options, Step 2 – Eliminate Technically Infeasible Control Options, Step 3 – Rank Remaining Control Technologies by Control Effectiveness and Step 4 – Evaluate the Most Effective Controls and Document Results

There are no control options identified in the RBLC that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from small natural gas combustion units. See below table for summary of $PM_{10}/PM_{2.5}$ BACT determinations from the RBLC database:

Facility/ RBLC ID	Permit Date	Basis	Process	PM_{10} BACT Limit	$PM_{2.5}$ BACT Limit	Add-On Controls
SeverCorr LLC Columbus, Mississippi	07/15/11	BACT-PSD	Ladle preheaters, ladle dry-out heaters, Tundish preheaters, Tundish dry-out heaters, vertical ladle holding station, annealing furnaces, vacuum degasser boiler, boilers	None	None	Combustion of natural gas only

[3] AP 42, Fifth Edition, Volume I, Chapter 1.4: External Combustion Sources Natural Gas Combustion, July 1998

Facility/ RBLC ID	Permit Date	Basis	Process	PM_{10} BACT Limit	$PM_{2.5}$ BACT Limit	Add-On Controls
Nucor Steel, AR Blytheville, AR	06/10/11	BACT-PSD	Pickle Line Boilers, natural gas fired burners and dryers, ladle dryers	0.0076 lb/MMBtu	None	None
Sasol North America LA-0244	11/29/10	BACT-PSD	87.30 MMBtu/hr charge Heater	Total PM_{10}: 0.01 lb/MMBtu	-	No controls
Sasol North America LA-0244	11/29/10	BACT-PSD	21.00 MMBtu/hr startup Heater	Total PM_{10}: 0.01 lb/MMBtu	-	No controls
Lake Charles Cogeneration LLC LA-0231	06/22/09	BACT-PSD	34.20 MMBtu/hr Shift Reactor Startup Heater	Total PM_{10}: 0.007 lb/MMBtu	-	Good design and proper operations
Competitive Power Ventures MD-0040	11/12/08	BACT-PSD	1.70 MMBtu/hr Heater	Filterable PM_{10}: 0.0070 lb/MMBtu	Filterable 0.0070 lb/MMBtu (LAER)	No controls
Mid-American Steel and Wire Company OK-0128	09/08/08	BACT-PSD	Ladle Preheater and refractory drying	0.0076 lb/MMBtu (total)	-	Combustion of natural gas
Thysenkrupp Steel and Stainless USA, LLC AL-0230	08/17/07	BACT PSD	33.40 MMBtu/hr Batch Annealing Furnaces	0.0076 lb/MMBtu	-	No controls
Nucor Decatur, LLC AL-0231	06/12/07	BACT-PSD	98.7 MMBtu/hr Galvanizing Furnace	PM: 0.0076 lb/MMBtu	-	No control
Republic Engineered Products, Inc OH-0303	08/30/05	LAER	Ladle Dryers/Preheaters	7.6 lb/mmscf (filterable)	7.6 lb/mmscf (filterable)	Good combustion control with proper natural gas burner design, no add-on controls
6Nucor Steel IN-0090	01/19/01	BACT-PSD	Ladle Preheaters	-	-	Combustion of natural gas or propane

Facility/ RBLC ID	Permit Date	Basis	Process	PM_{10} BACT Limit	$PM_{2.5}$ BACT Limit	Add-On Controls
Arkansas Steel Associates AR-0044	01/05/01	BACT-PSD	Ladle Preheaters	0.20 lb/hr (filterable)	-	Natural gas combustion/ Good combustion practices

As shown in the above table, no add-on controls are used for $PM_{10}/PM_{2.5}$ from the natural gas combustion equipment.

Step 5 - Select BACT

The RACT/BACT/LAER Clearinghouse (RBLC) and review of other permits reveal that similar natural gas combustion devices use fuel specifications and good combustion practices for controlling PM emissions. No similar sized natural gas combustion devices were identified add-on PM controls as BACT.

Thus, BACT is defined as combustion of clean fuel and good combustion practices. For the natural gas combustion sources associated with the proposed Plant, combustion of natural gas and good combustion controls were the only control methods evaluated. Since the highest level of PM control as noted above will be implemented by MS Silicon, an analysis of economic, energy and environmental impacts was not performed.

BACT for the natural gas combustion devices is as follows:

- **Combustion of natural gas; and**
- **Good operating practices.**

BACT Analysis for $PM_{10}/PM_{2.5}$ from Material Storage and Handling (AA-101, AA-101a, AA-102, AA-102a, AA-103, AA-103a, AA-104, AA-301)

Raw materials will be received by truck at the site. The primary materials to be handled and stored at the silicon production plant are as follows:

- Coal;
- Wood;
- Limestone and
- Quartz.

Upon receipt the raw materials will be unloaded, conveyed and stored in outside piles. The raw materials will then be transferred via front end loaders to day bins in the submerged arc furnace building.

Add on control devices such as a baghouse or wet suppression will minimize particulate emission rates from material storage and handling. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Baghouses typically achieve PM control efficiencies of greater than 99%.

Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50-70%.

AA-101: Material Transfer to and from Coal Storage Pile

Coal will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of coal.

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Review of the RBLC database and recent permit applications indicated that viable PM controls for coal transfer to and from storage piles is a fugitive dust control plan (windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions as required). Refer to table below for a listing of recent BACT determinations for coal receiving and handling operations.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.

- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.

- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The table below lists the proposed particulate BACT determination, along with the existing particulate BACT determinations, for coal receiving and handling and coal transferring. All data in the table is based on the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

The limits being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for coal handling operations at these facilities.

Existing $PM/PM_{10}/PM_{2.5}$ BACT Limits - Material Transfer to and from Coal Storage Pile

Facility	Date	Basis	Source	$PM_{10}/PM_{2.5}$ BACT Limit	BACT Control Method
East Kentucky Power Cooperative KY-0100	4/9/10	BACT-PSD	Coal Stockpile and unloading	PM: 10% opacity 3-minute	Wet suppression, dust suppressant, lowering well and compaction
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Coal storage piles	PM_{10}: 12.3 tpy rolling 12-month period	3-Sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
Martin Marietta Magnesia Specialties OH-0321	11/13/08	BACT-PSD	Coal and coke material handling	PM_{10}: 0.95 tpy rolling 12-month period	Building enclosure and high moisture content coal and coke >5%
Homeland Energy Solutions, LLC IA-0089	08/28/07	BACT-PSD	Coal receiving and handling	Filterable PM_{10}: 0.005 gr/dscf	Use of baghouse and water fogging. (Baghouse used to control storage bins and water fogging used to eliminate PM in unloading area
University of Northern Iowa IA-0086	5/3/07	BACT-PSD	Coal pile receiving and reclaim	Filterable PM_{10}: 095% control	Dust suppressant

Step 5 - Select BACT

BACT for the Material Transfer to and from Coal Storage Pile (AA-101) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate

Material Transfer to and from – Wood Storage Pile (AA-102)

Wood will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of this material. Since these operations will have the potential to emit minor levels (due to the inherent moisture content of the wood to be handled and stored) of $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of a fugitive type release, typical PM control technologies are not appropriate for these types of operations. The types of control measures used for materials handling operations can be classified as best management practices and include inherent pollution control techniques (covered conveyors, partially enclosed conveyor drop points, minimization of pile drop discharge distance, etc.).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Review of the RBLC database and recent permit applications indicated that viable PM controls for wood transfer to and from storage piles is a fugitive dust control plan (windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions as required). Refer to table below for a listing of recent BACT determinations for wood receiving and handling operations.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.
- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.
- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The table below lists the proposed particulate BACT determination, along with the existing particulate BACT determinations, for wood pile receiving, handling, and transferring. All data in the table is based on the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

The limits being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for wood handling operations at these facilities.

Existing $PM/PM_{10}/PM_{2.5}$ BACT Limits – Wood Storage and Handling

Facility	Date	Basis	Source	$PM_{10}/PM_{2.5}$ BACT Limit	BACT Control Method
Southeast Regional Fuels, LLC FL-0322	12/23/10	BACT-PSD	Biomass material handling and preparation	5% opacity	To minimize fugitive, PM_{10} and $PM_{2.5}$, biomass conveyors shall be enclosed. Where required to meet the 5 % opacity requirement, the permittee shall install dust collectors on the conveyor transfer and drop points. The dust collectors shall be designed to obtain an outlet PM loading of 0.005 grains per dry standard cubic foot (gr/dscf). Additional practices: Enclosing material drop points, transfer points, shredders and screens wherever practical; Contouring storage piles to minimize wind erosion; Utilizing water sprays on storage piles as needed;

Facility	Date	Basis	Source	$PM_{10}/PM_{2.5}$ BACT Limit	BACT Control Method
Georgia Power Co. GA-0140	12/03/10	BACT-PSD	Biomass storage and handling	-	Partial enclosures for the conveyors; Partial enclosures for the transfer points
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Biomass Storage Piles	AP-42 Calculation: 1.0 tpy fugitive PM_{10} No visible emissions except for 13-min in any 60-min period	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
Weyerhauser Co. LA-0201	05/24/06	BACT-PSD	Chip Handling	Filterable PM_{10} 0.0001 lb/T	Covered conveyors
Kingsford Manufacturing Company MS-0081	09/09/05	BACT-PSD	Wood Receipt	Filterable PM_{10}: 0.0020 lb/T wood	Good work practice standards and partial enclosure of truck dump area
			Wood Storage	Filterable PM_{10}: 0.0065 lb/T wood	Good work practice standards

The above table presents BACT limits for $PM_{10}/PM_{2.5}$ emissions from wood/biomass material handling operations. The limit being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for other material handling operations at other types of facilities.

Review of state permits for similar operations (i.e., ferroalloy operations) revealed the following:

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009 Date: 11/26/10	Raw Material Handling - Raw Material Transfer and Storage operations begin with the receipt of raw materials via truck or rail. Coal, coke, charcoal, gravel, woodchips, and turnings are unloaded via crane to piles or directly to a below grade conveyor or pit. Coal is transferred to the pit, from which it is conveyed up to enclosed raw material storage bins or unloaded to outdoor storage piles. Gravel is unloaded to piles, transported by crane to a conveyor, screened, and conveyed up to enclosed storage bins. Wood chips are dumped from a trailer to the pit and transported up to enclosed storage bins. From indoor bins, the raw materials are weighed and dropped to a skip bucket from which they are transferred to the top of the furnace.	No limit	Enclosed storage bins
Globe Metallurgical Selma, AL 104-0001 Date: 9/10/10	Product Handling – Raw material receiving, transfer and storage	Process weight rate limitation 20% opacity in one 6-minute average in any 60 minute period	No add-on controls
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006 Date: 01/18/06	Raw material storage piles	No limit	None

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105 Date: 10/24/01	Raw material unloading and handling	20% opacity as a 3-minute average	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust
	Raw Material and Waste Storage Piles – Load in or load out, wind erosion	No visible particulate emissions except for 13 minutes during any 60-minute period	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust

Step 5 -Select BACT

BACT for the wood material handling operations (AA-102) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for this operation since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate

Material Transfer to and from Quartz/Limestone Storage Piles (AA-103, AA-104)

Quartz and limestone will be delivered to the site either by truck. Fugitive emissions of PM will be generated during the receiving, transferring, and handling of these materials. Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of a fugitive type release, typical PM control technologies are not appropriate for these types of operations. The types of control measures used for materials handling operations can be classified as best management practices and include

inherent pollution control techniques (covered conveyors, partially enclosed conveyor drop points, minimization of pile drop discharge distance, etc.).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Step 2 - Elimination of Technically Infeasible Fugitive PM Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.
- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.
- Implementation of fugitive dust control plan: >50% control efficiency.

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis. No control options were eliminated for economic reasons.

Step 4 - Evaluate the Most Effective Controls and Document the Results

Review of the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC) did not identify quartz handling and storage operations.

Review of state permits for similar operations (i.e., ferroalloy operations) revealed the following:

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Niagara Falls, NY Permit#: 9-2911-00078/00009 Date: 11/26/10	Raw Material Handling - Raw Material Transfer and Storage operations begin with the receipt of raw materials via truck or rail. Coal, coke, charcoal, gravel, woodchips, and turnings are unloaded via crane to piles or directly to a below grade conveyor or pit. Coal is transferred to the pit, from which it is conveyed up to enclosed raw material storage bins or unloaded to outdoor storage piles. Gravel is unloaded to piles, transported by crane to a conveyor, screened, and conveyed up to enclosed storage bins. Wood chips are dumped from a trailer to the pit and transported up to enclosed storage bins. From indoor bins, the raw materials are weighed and dropped to a skip bucket from which they are transferred to the top of the furnace.	No limit	Enclosed storage bins
Globe Metallurgical Selma, AL 104-0001 Date: 9/10/10	Product Handling – Raw material receiving, transfer and storage	Process weight rate limitation 20% opacity in one 6-minute average in any 60 minute period	No add-on controls
West Virginia Alloy, Inc. Alloy, West Virgina R30-01900001-2006 Date: 01/18/06	Raw material storage piles	No limit	None

Facility/	Process	PM_{10} BACT Limit	Add-On Controls
Globe Metallurgical Inc Waterford, OH ID: 06-84-00-0105 Date: 10/24/01	Raw material unloading and handling	20% opacity as a 3-minute average	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust
	Raw Material and Waste Storage Piles – Load in or load out, wind erosion	No visible particulate emissions except for 13 minutes during any 60-minute period	Reasonable available control measures that are sufficient to minimize of eliminate visible emissions of fugitive dust

The limit being proposed by MS Silicon is equivalent to or lower than the BACT limitations established for other material handling operations at other types of facilities.

Step 5 -Select BACT

BACT for the quartz and limestone storage pile handling operations (AA-103, AA-104) is proposed as the following:

- Best management practices including the incorporation 3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions;
- Development of a fugitive dust control plan to minimize PM emissions; and
- No emission limit is being proposed for these operations since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

Material Handling (Coal, Wood, Quartz) Baghouse (AA-101a, AA-102a, AA-103a) and Product Handling Area Baghouse (AA-301 and AA-403)

Material from the storage piles will be conveyed via front end loaders to enclosed day bins. From the day bins, the raw materials will be weighed and dropped to a skip bucket from which they will be transferred to the top of one (1) of four (4) semi-enclosed submerged arc furnaces for processing.

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of point source release, these emission can be controlled using the particulate matter controls described in previous sections of this document.

Step 2 - Elimination of Technically Infeasible $PM_{10}/PM_{2.5}$ Control Alternatives

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull air from the SAF and push the dust laden air through the fabric filters and into the ambient air

via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from material handling operations due to their effectiveness. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 -Select BACT

BACT for the raw material and product handling operations (AA-101a, AA-102a, AA-103a, AA-301, AA-403) is proposed as the following:

- Baghouse for PM control; and
- A $PM_{10}/PM_{2.5}$ limitation of 0.003 gr/dscf.

It should be noted that MS Silicon is voluntarily designing the baghouse to meet 0.0015 gr/dscf to minimize the potential impact on $PM_{10}/PM_{2.5}$ air quality. This emission rate does not constitute BACT.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Silica Fume Silos (AA-404)

Silica fumes collected in the SAF baghouses will be pneumatically transferred to the silica fume silos. In the silos, the silica fumes will be densified to about 45 lbs/cu.ft., prior to dispatch to cement and refractory manufacturers that can use this dust in their other operations (i.e., cement and refractory).

Step 1 - Identify Available $PM_{10}/PM_{2.5}$ Control Technologies

Since these operations will have the potential to emit $PM_{10}/PM_{2.5}$ emissions and will typically be in the form of point source release, these emission can be controlled using the particulate matter controls described in previous sections of this document.

Step 2 - Elimination of Technically Infeasible $PM_{10}/PM_{2.5}$ Control Alternatives

The test for technical feasibility of any control option is whether it is both available and applicable to reducing $PM_{10}/PM_{2.5}$ emissions from the SAF operations. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) ESPs - use an electrostatic field to charge particulate matter contained in the gas stream and then attract and collect the particles on a collection surface of opposite charge. ESPs have very high removal

efficiencies (99% or better) for many sources of particulates. However, they are not suitable for all types of applications. Due to the electromagnetic properties of small charged particles of metal compounds in an electric field, the particles adhere very strongly to the collection plates of an ESP and are extremely difficult to dislodge, resulting in ineffectivity of the ESP. Therefore, ESP is considered technically infeasible for controlling particulate emissions from the SAF.

(b) High Efficiency Cyclones - Particulate removal in cyclone collectors is achieved through the action of inertial forces, especially centrifugal. As the gas stream enters the top of the cyclone, a vortex is induced as it is forced to travel a circular path. Centrifugal forces cause the heavier particles to concentrate near the outer wall of the cyclone and particle of lesser mass to remain closer to the center of the vortex. Frictional and gravitational forces then act on the particles closest to the wall, causing them to fall toward the bottom of the cyclone, where they are collected in a hopper. Within the lower segment of the cyclone, the direction of the gas-flow vortex is reversed, and an inner ascending vortex is formed. The inner vortex consists of comparatively particulate-free air, which is collected through an outlet duct at the top of the cyclone. Cyclone collectors are considered technically feasible. However, they achieve the lowest particulate removal efficiencies (less than 90%) of all particulate control devices, especially for submicron particulates that will be emitted from the SAF.

(c) High Energy Scrubbers - High energy wet scrubbers are technically feasible and can achieve a high particulate collection efficiency (90% or better), but at the expense of a punitive pressure drop (ranging from 6 - 20 inches of water), higher operational utilities, generation of large quantities of sludge along with the associated problem of sludge handling, de-watering, and disposal.

(d) Fabric filters or baghouses are technically feasible for collecting fine particulate matter emissions associated with SAFs or other types of furnaces that have high particulate emissions. They can also achieve the highest control efficiency, among other particulate control devices, as applied to SAF operations.

(i) Positive pressure baghouses operate at internal pressures greater than the atmospheric pressure. Typically, the fans are located before the fabric filters. This allows the fans to pull air from the SAF and push the dust laden air through the fabric filters and into the ambient air via a continuous ridge vent (old design) rather than a stack. The discharge area of a ridge vent is on the order of four times that of a single stack.

(ii) Negative pressure baghouses operate at internal pressure less than atmospheric. The fans are located after the fabric filters. This allows the fans to pull the gas laden air from the SAF, through the fabric filters, and then push the air up through a central stack.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The following remaining control options are in order of descending control effectiveness:

(a) Fabric filters or baghouses - 99.9%;

(b) High Energy Scrubbers - 90% or more; or

(c) High Efficiency Cyclones - 50 to 90%.

Step 4 – Evaluate the Most Effective Controls and Document Results

Fabric filtration is the predominant control option for abatement of particulate emissions from these operations. Scrubbers and cyclones are not considered as effective as fabric filters or baghouses for controlling particulate emissions from silicon production operations.

Step 5 -Select BACT

BACT for the silica fume silos (AA-404) is proposed as the following:

- Bin vent filter for PM control; and
- A $PM_{10}/PM_{2.5}$ limitation of 0.01 gr/dscf.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Emergency Equipment (AA-501)

The emergency equipment includes the following:

- Diesel-Fired Emergency Generator (1 rated at 670-HP): 0.001 tpy $PM_{10}/PM_{2.5}$.

Step 1 – Identify Control Options

There are no control options identified in the RBLC that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from emergency generators. See below table for summary of PM BACT determinations from the RBLC database.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

The emergency diesel fired generator associated with the proposed project will be used primarily for emergency situations, if any. However, to maintain the integrity of the equipment, the generator will be operated for 100 hours per year or less. The projected annual $PM_{10}/PM_{2.5}$ emissions rate is 0.001 tpy. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank Remaining Alternatives by Control Effectiveness

The most effective method for control of $PM_{10}/PM_{2.5}$ emissions from operation of the emergency fuel combustion devices is the use of fuel specifications that employ clean burning fuels, implementation of good combustion practices and use of combustion controls inherent to the design of the individual combustion devices.

Step 4 - Evaluate Most Effective Controls

Since there are no other feasible technologies to control $PM_{10}/PM_{2.5}$ emissions from the emergency equipment, economic, energy and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

The following table lists the existing $PM_{10}/PM_{2.5}$ BACT determinations for diesel fired emergency equipment. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Facility/ RBLC ID	Permit Date	Process	$PM_{10}/PM_{2.5}$ BACT Limit	Add-On Controls
Southeast Renewable Fuels (FL-0322)	12/23/10	Emergency ULSD Generators (two 2,682 HP)	Total PM: 0.2 g/KW-H	No controls The emergency generators shall comply with the emission limit and demonstrate compliance in accordance with the procedures given in NSPS 40 CFR 60, Subpart IIII.
		Emergency ULSD Fire Pump (One 600 HP)	Total PM: 0.15-g/HP-hr	No controls The fire pumps shall comply with the emission limit and demonstrate compliance in accordance with the procedures given in NSPS 40 CFR 60, Subpart IIII.
Idaho Power Company ID-0018	6/25/10	750 KW Emergency Diesel Generator	PM: 0.2 g/KW-H -H	Tier 2 Engine, Good combustion practices
Consumers Energy (MI-0389	12/29/09	2000 KW Emergency ULSD Generator	Total PM: 0.2 g/KW-H Total PM_{10}: 0.0573 g/KW-H	Engine design and operation, 15 ppm sulfur fuel Operational Limits: 1 hr/day, 500 hrs/yr for $PM_{2.5}$ NAAQS
Verenium (FL-0318)	12/10/09	2000 KW Emergency generators	Total PM: 0.2 g/KW-H	None
		Emergency ULSD Fired Pump	Total PM: 0.15-g/HP-hr	The fire pump engine is an Emergency Stationary Compression Ignition Internal Combustion Engine (Stationary ICE) and shall comply with applicable provisions of 40 CFR 60, Subpart IIII
Lake Charles Cogeneration, LLC	06/22/09	Emergency Diesel Power Generator	Total PM_{10} 0.06 lb/h	Comply with 40 CFR 60 Subpart IIII

Facility/ RBLC ID	Permit Date	Process	$PM_{10}/PM_{2.5}$ BACT Limit	Add-On Controls
(LA-0231)		Engines (1341 HP)		
Southeast Idaho Energy, LLC (ID-0017)	2/10/09	2 MW Emergency Generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, ULSD fuel, limited to 100 hours of operation per year
		500 KW emergency generator	Comply with NSPS IIII	Good combustion practices, EPA certified per NSPS IIII, ULSD fuel, limited to 100 hours of operation per year
Associated Electric Cooperative Inc (OK-0129)	1/23/09	2200 HP low sulfur diesel emergency generator	Total PM_{10}: 0.2 g/KW-H	None
		267 HP low sulfur diesel emergency fir pump	Total PM_{10}: 0.4 G/HP-H	

As shown in the table above, BACT for the emergency equipment is compliance with NSPS IIII and good combustion/operating practices.

Step 5 – Select BACT for $PM_{10}/PM_{2.5}$ from Emergency Equipment

BACT is proposed as compliance with NSPS IIII and good combustion/operating practices.

B BACT analysis for $PM_{10}/PM_{2.5}$ Emissions from Wood Chipper (AA-102b)

The portable electric wood chipper will be used for as needed wood grinding/chipping and will be limited to 2080 hours per year of operation. Fugitive particulate emissions can occur from operation of the wood chipper (AA-102b). The wood chipper operation design will include an enclosure that will minimize fugitive dust emissions.

Step 1 – Identify Control Options

Due to the limited hours of operation and the fugitive nature of the operation, there are no control options that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from wood chippers.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

No wood chippers were identified in the RBLC database. Based on a review of similar emission sources, these emission sources typically do not have any add-on controls and should be operated per manufacturer's specifications.

Step 3 - Rank the Remaining Control Technologies

The only remaining technically feasible method for control of particulate emissions resulting from operation of the wood chipper is an enclosure that will minimize fugitive dust emissions and limited hours of operation. The combination of these control methods represents the Top-Rated control.

Step 4- Evaluate the Most Effective Control

Since there are no other feasible technologies available that could achieve the same level of PM control as that being proposed for the wood chipper, equipment, economic, energy, and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

Step 5 - Select BACT

The following has been proposed as BACT for controlling PM emissions from the wood chipper:

- Operation of the wood chipper with an enclosure or similar that will minimize fugitive dust emissions;
- Limited hours of operation for the wood chipper; and
- No emission limit is being proposed for this operation since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

C BACT analysis for $PM_{10}/PM_{2.5}$ Emissions from Bulldozer Storage Pile Processing (AA-105)

Bulldozers will be used to groom and maintain the storage piles. The emissions from these operations are fugitive in nature.

Step 1 – Identify Control Options

Due to the fugitive nature of the operation, there are no add-on control options that are technically feasible to control $PM_{10}/PM_{2.5}$ that is emitted from bulldozing the storage piles. Review of the RBLC database and other silicon plant permits did not identify similar operations.

Step 2 - Technical Feasibility of $PM_{10}/PM_{2.5}$ Control Alternatives

Based on the nature of the operation, the only viable controls are the use of best management practices (i.e., dust minimization techniques including as needed water spray application and wind screens).

Step 3 - Rank the Remaining Control Technologies

The only remaining technically feasible method for control of particulate emissions resulting from bulldozing operations on the storage piles is the use of best management practices (i.e., dust minimization techniques including as needed water spray application and wind screens). The combination of these control methods represents the Top-Rated control.

Step 4- Evaluate the Most Effective Control

Since there are no other feasible technologies available that could achieve the same level of PM control as that being proposed for the storage pile processing operations, equipment, economic, energy, and environmental impact analyses were not performed, nor are required by USEPA's Top-Down approach.

Step 5 - Select BACT

The following has been proposed as BACT for controlling PM emissions from the storage pile processing (AA-105):

The proposed BACT for storage pile processing (bulldozing) associated with this project is:

- The development of a dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, wind screens and speed reduction, as required; and
- No emission limit is being proposed for this operation since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Storage Pile Wind Erosion (AA-106)

PM emissions may be generated by wind erosion from the storage piles. Because the material stored will be fairly heavy and will not consist of a fine dust-like material, potential emissions should be minimal.

Step 1 - Identification of Available $PM/PM_{10}/PM_{2.5}$ Controls

- Add on control devices such as a fabric filter and enclosed conveyance can be used to minimize particulate emission rates from material storage and handling operations. A baghouse is an air pollution abatement device used to trap particulates by filtering gas streams through large fabric bags. Fabric filters typically achieve PM control efficiencies of greater than 99%.
- Wet suppression systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems: liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. Wet suppression systems typically achieve PM control efficiencies of 50 to >90%.
- Best management plan (fugitive dust control plans) can provide for additional control of PM through managing the operations/equipment that generates the fugitive PM emissions. Implementation of these plans can reduce PM fugitive emissions by more than 50%.

Step 2 - Elimination of Technically Infeasible $PM/PM_{10}/PM_{2.5}$ Control Alternatives

The above technologies are technically feasible and will be ranked for evaluation as part of the BACT evaluation for controlling particulate emissions from this operation.

- Fabric Filter control devices: 99% control efficiency – The emissions from this source are fugitive in nature and thus cannot be effectively captured and controlled.

- Wet Suppression: 50 to > 90% control efficiency - The use of wet suppression systems for this source is feasible.

- Implementation of fugitive dust control plan: >50% control efficiency

Step 3 - Rank the Remaining Control Technologies by Control Effectiveness

The top ranked control option is fugitive dust control plan including the use of wet suppression on an as needed basis and the implementation of a fugitive dust control plan.

Step 4 - Evaluate the Most Effective Controls and Document the Results

The following table lists existing particulate BACT determinations, for material storage pile operations. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Material Storage Areas					
Facility	**Date**	**Basis**	**Source**	**$PM/PM_{10}/PM_{2.5}$ BACT Limit**	**BACT Control Method**
Nucor Steel OH-0341	12/23/10	BACT-PSD	Scrap steel storage piles	Fugitive PM - 0.43 ton/yr Fugitive PM_{10} - 0.22 ton/yr Fugitive $PM_{2.5}$ - 0.06 ton/yr	Minimize drop height
Consolidated Environmental Management – Nucor Steel LA-0239	5/24/10	BACT-PSD	Coal Storage Pile	Total PM - 3.99 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
			Slag processing storage piles	Total PM - 1.19 ton/yr	BACT is selected to be wet suppression of dust generating sources by water sprays
			Iron Ore Pellet storage piles	Filterable PM - 13.88 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site

Material Storage Areas					
Facility	**Date**	**Basis**	**Source**	**$PM/PM_{10}/PM_{2.5}$ BACT Limit**	**BACT Control Method**
			Flux storage piles	Filterable PM - 2.18 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
			Granulated slag storage piles	Filterable PM - 2.18 ton/yr	BACT is selected to be implementation of wet suppression of dust generating sources by water sprays at each storage pile site
Osceola Steel Company, Georgia	3/15/10	BACT-PSD	Slag storage piles	No Emission limit	The control method is source control, either through minimizing drop height or wet suppression of the material. In addition, roadways and stockpiles of slag to be processed will also be treated by wet suppression
Ohio River Clean Fuels, LLC OH-0317	11/20/08	BACT-PSD	Coal Storage Piles	Fugitive PM - 12.3 tpy PM_{10}	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
			Biomass Storage Piles	Fugitive PM - 2.7 tpy PM_{10}	3-sided windscreen barrier, reduced drop heights, use of chemical stabilization dust suppressants and/or watering to reduce any visible emissions
			Slag storage piles	Fugitive PM 1.6 ton/yr from wind 11.7 ton/yr load out	Use of water trucks or fire hoses to maintain high moisture content. Water applied for load out. Minimize free fall distances. Haul trucks covered.

Material Storage Areas					
Facility	**Date**	**Basis**	**Source**	**$PM/PM_{10}/PM_{2.5}$ BACT Limit**	**BACT Control Method**
Nucor Steel, Indiana	6/1/12	BACT-PSD	Slag Storage	Opacity limits: Stockpiling of slag adjacent to the grizzly feeder = 3 % Wind erosion of stockpiles = 3% Continuous stacking of processed slag to stockpiles = 3%	Fugitive Dust Control Plan

Step 5 -Select BACT

Proposed BACT for Material Storage Pile Operations (AA-106):

- Implementation of a fugitive dust control plan. Visible emissions from the storage piles shall be controlled by the application of water, other dust suppressants or the use of wind screens, as needed.
- No emission limit is being proposed for these operations since there is no available test method to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

BACT Analysis for $PM_{10}/PM_{2.5}$ Emissions from Paved and Unpaved Roads

Fugitive particulate emissions can occur from paved and unpaved surfaces.

Step 1: Identify all control technologies

The RACT/BACT/LAER (RBLC) Clearinghouse and review of other permits reveal that the PM control for paved and unpaved roads includes the use dust suppressants, roadway sweeping, covering of transport vehicles, and speed limits.

Add-on Control Technology:

Watering and the use of chemical wetting agents are the principal means for control of emissions from materials handling operations involving transfer of bulk minerals in aggregate form. Dust control can be achieved by: (a) source extent reduction (e.g., mass transfer reduction), (b) source improvement related to work practices and transfer equipment such as load in and load out operations (e.g., drop height reduction, wind sheltering, moisture retention), and (c) surface treatment (e.g., wet suppression).

In most cases, good work practices provide substantial opportunities for emission reduction without the need for investment in a control application program. In particular, spillage of material caused by pile lead-out and maintenance equipment can add a large source component associated with traffic entrained dust. The traffic dust component may easily dominate over emissions from transfer of material and wind erosion. The prevention of spillage and subsequent spreading of material by vehicles traversing the area is essential to cost-effective emission control. If spillage cannot be prevented because of the need for intense use of mobile equipment in the storage pile area, then regular cleanup should be employed as a necessary mitigative measure.

Fugitive emissions from paved roadways can also be controlled by wet suppression systems. These systems use liquid sprays or foam to suppress the formation of airborne dust. The primary control mechanisms are those that prevent emissions through agglomerate formation by combining small dust particles with larger aggregate or with liquid droplets. The key factors that affect the degree of agglomeration and, hence, the performance of the system are the coverage of the material by the liquid and the ability of the liquid to wet small particles. There are two types of wet suppression systems—liquid sprays which use water or water/surfactant mixtures as the wetting agent and systems which supply foams as the wetting agent. The wetting agent can be water or a combination of water and a chemical surfactant. This surfactant, or surface active agent, reduces the surface tension of the water. As a result, the quantity of liquid needed to achieve good control is reduced.

Step 2: Eliminate Technically Infeasible Options

The PM control options noted above are feasible control alternatives. Therefore, there is no elimination of technically infeasible fugitive PM control alternatives. There are no other known control alternatives (per review of the BACT/LAER clearinghouse) that have been utilized on roads.

Step 3: Rank Remaining Technically Feasible Control Options

Development of a fugitive dust control plan which includes removal of deposits on roadways, speed limitation on vehicle traffic and wet suppression techniques as needed will be employed as BACT for paved and unpaved roads.

Step 4: Evaluate the Most Effective Controls and Document the Results

The following table lists the proposed particulate BACT determination along with the existing particulate BACT determinations for the paved and unpaved roads. All data in the table is based on the information obtained from the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC), and electronic versions of permits available at the websites of other permitting agencies.

Step 5 – Select BACT

A review of USEPA's RACT/BACT/LAER Clearinghouse identified the following with respect to paved roads:

Facility/ RBLC ID	Permit Date	Basis	Process	PM BACT Limit	Add-On Controls
V&M Star OH-0344	1/27/11	BACT-PSD	Paved and unpaved roadways and parking areas	Fugitive PM10: 7.7 tpy	Employ best available control measures: watering, sweeping, chemical stabilization, or suppressants applied at sufficient frequencies
Nucor Steel OH-0341	12/23/10	BACT-PSD	Roadways	Fugitive PM10: 5.93 tpy	Best available control measures to include watering, resurfacing, chemical stabilization, and/or speed reduction at sufficient frequency to ensure compliance
Flopam, Inc. LA-0240	06/14/10	BACT-PSD	Roadway Fugitives	Total PM10: 0.04 lb/hr	Main roadway shall be paved where practical. Precautions shall be taken to prevent dust from becoming airborne
Consolidated Environmental Management, Inc LA-0239	05/24/10	BACT-PSD	Unpaved Road Fugitive Dust	18.69 lb/hr 81.85 tpy	BACT for road dust is to pave roadways where practicable including areas where the extra heavy vehicles (greater than 50 tons in weight) will not cause damage to paving. Unpaved roads shall utilize water spray or dust suppression chemicals to reduce emissions. Additionally, reduced speed limits of less than or equal to 15 mph will be enforced on all unpaved roadways
V&M Star OH-0328	04/10/09	BACT-PSD	Roadways and parking areas	Filterable PM_{10}: 12.4 tpy using AP-42 emission factors	Control measures sufficient to minimize or eliminate emissions

Facility/ RBLC ID	Permit Date	Basis	Process	PM BACT Limit	Add-On Controls
Rumke Sanitary Landfill OH-0330	12/23/08	BACT-PSD	Paved roadways and parking areas	Filterable PM_{10}: 15.1 tpy	Best available control measures to minimize or prevent emissions, including water flushing and sweeping of paved roads/parking areas; and applying water or other dust suppressant to unpaved roads..
Southwest Electric Power Company AR-0094	11/05/08	BACT-PSD	Roads	PM: 1.1 lb/hr	Watering/dust suppression chemicals
New Steel International, Inc. OH-0315	05/06/08	BACT-PSD	Paved roadways and parking areas	PM: 153.4 tpy fugitive dust	Control measures include application of wet suppressants, watering, speed reduction and vacuuming or sweeping

Based on information presented reviewed for this BACT analysis, the $PM_{10}/PM_{2.5}$ control measures presented above focus solely on measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping. No other applicable $PM_{10}/PM_{2.5}$ control measures were identified in this review.

BACT for paved and unpaved roads associated with this project is proposed as:

- The development of a dust control plan including the use of measures designed to eliminate dust such as application of wet suppressants, watering, speed reduction and vacuuming or sweeping, as required; and
- No emission limit is being proposed for emissions from paved and unpaved roads since there are no available test methods to determine the $PM/PM_{10}/PM_{2.5}$ emission rate.

Best Available Control Technology (BACT) Analysis - Emissions of NO_x

The BACT evaluation focuses on the control technologies that have been demonstrated and commercially available for control of NO_x emissions. Because of the importance of controlling these emissions, MS Silicon evaluated technologies that have been demonstrated on similar processes so that emissions of NO_x will be controlled to the levels specified.

Nitrogen oxides formation occurs by three fundamentally different mechanisms. The principal mechanism of NO_x formation in natural gas combustion is thermal NO_x. The thermal NO_x mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. Most NO_x formed through the thermal NO_x mechanism occurs in the high temperature flame zone near the burners. The formation of thermal NO_x is affected by three furnace-zone factors: (1) oxygen concentration, (2) peak temperature, and (3) time of exposure at peak temperature. As these three factors increase, NO_x emission levels increase. The emission trends due to changes in these factors are fairly consistent for all types of natural gas-fired boilers and furnaces. Emission levels vary considerably with the type and size of combustor and with operating conditions (e.g., combustion air temperature, volumetric heat release rate, load, and excess oxygen level). The second mechanism of NO_x formation, called prompt NO_x, occurs through early reactions of nitrogen molecules in the combustion air and hydrocarbon radicals from the fuel. Prompt NO_x reactions occur within the flame and are usually negligible when compared to the amount of NO_x formed through the thermal NO_x mechanism. However, prompt NO_x levels may become significant with ultra-low-NO_x burners. The third mechanism of NO_x formation, called fuel NO_x, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Due to the characteristically low fuel nitrogen content of natural gas, NO_x formation through the fuel NO_x mechanism is insignificant. [4]

NO_x Emission Sources Subject to Control Technology Evaluation

The NO_x emission sources associated with the proposed plant that are included in this NO_x BACT evaluation are as follows:

- Semi-Enclosed Submerged Arc Furnaces (SAFs);
- Natural gas fired combustion equipment; and
- Emergency equipment.

For a summary of the estimated NO_x emission rates for the sources identified above, please refer to the following table:

NO_x Emission Rates for Sources Evaluated for BACT

[4] AP 42, Fifth Edition, Volume I, Chapter 1.4: External Combustion Sources Natural Gas Combustion, July 1998

Equipment Description	NO_x Emission Rate (tons/year)
Semi-Enclosed Submerged Arc Furnace (SAFs)	1892.2
Natural Gas Combustion Equipment • Ladle preheaters	14.0
Emergency Equipment: • Emergency Generators	0.02
Total	**1906.2**

BACT Analysis for NO_x Emissions from Submerged Arc Furnaces (AA-201)

Step 1 – Identify Control Options

The first step of the Top-Down BACT analysis is to assess the proposed emission reduction options. The sources of information on emission reduction options vary for the air emission sources being analyzed. The following information resources were consulted in searching for the alternatives available for controlling NO_x emissions from plant operations:

1. On-line USEPA Control Technology Database;
2. State Air Quality Permits; and
3. Control Technology Vendors.

The following control technologies were identified and evaluated to control NO_x emissions from the semi-enclosed submerged arc furnace (SAF):

(a) Combustion Controls;

(b) Selective Catalytic Reduction (SCR);

(c) Non-Selective Catalytic Reduction (NSCR);

(d) $SCONO_x$ Catalytic Oxidation/Absorption; and

(e) Shell $DeNO_x$ System (modified SCR);

(1) Selective Non-Catalytic Reduction (SNCR) options -

(2) Exxon's Thermal $DeNO_x$ ®

(3) Nalco Fuel Tech's NO_xOUT®

(4) Low Temperature Oxidation (LTO).

Step 2 – Eliminate Technically Infeasible Control Options

The test for technical feasibility of any control option is whether it is both available and applicable to reducing NO_x emissions from the SAF. The previously listed information resources were consulted to determine the extent of applicability of each identified control alternative.

(a) Combustion Controls - There is an entire group of combustion controls for NO_x reduction from various combustion units as follows:

1. Low Excess Air (LEA) - This control option is typically used in conjunction with some of the other options. The use of this option will result in the generation of additional CO emissions, which is another pollutant under review in this BACT analysis. In addition, LEA is not very effective for implementation in electric arc furnaces that do not operate with combustion air feeds, since the combustion option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

2. Oxyfuel Burner - The SAF system does not employ natural gas-fired oxyfuel burners, thus, this option will be excluded for further consideration in this BACT analysis.

3. Overfire Air (OFA) - This control option is geared primarily for fuel NO_x reduction, which is not the major NO_x formation mechanism from SAFs. Further, this option is associated with potential operational problems due to low primary air, creating incomplete combustion conditions. Such conditions can result in inefficient processing and unacceptable increases in tap-to-tap times. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

4. Burners Out Of Service (BOOS) - BOOS and Load Reduction (or Deration) options - incorporate a reduction in furnace load, thereby, potentially reducing NO_x formation. This reduction must be balanced, however, against a longer period of NO_x generation resulting from the furnace's inability to efficiently melt material. Furthermore, both BOOS and Load Reduction are fundamentally inconsistent with the design criterion for the furnace, which is to increase furnace loadings to achieve enhanced production. Therefore, these control options are not technically feasible for this particular application and will not be considered any further in this BACT analysis.

5. Reduced Combustion Air Temperature - This control option inhibits thermal NO_x production. However, the option is limited to equipment with combustion air preheaters which are not applicable to the silicon production operations. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

6. Flue Gas Recirculation (FGR) - FGR option involves recycling a portion of the cooled exit flue gas back into the primary combustion zone. Typically, FGR is useful in reducing thermal NO_x formation by lowering the oxygen concentration in the combustion zone. The primary limitation of FGR is that it alters the distribution of heat (resulting in cold spots) and lowers the efficiency of the furnace. Since it may be necessary to add additional burners (hence, increasing emissions of other pollutants) to the SAF to reduce the formation of cold spots, FGR technology to reduce SAF NO_x emissions is not considered feasible. Since the SAF does not operate on burner combustion, but relies upon the electric arc and chemical energy for oxidation, neither pathway is amenable to FGR application. Thus, this option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(b) Selective Catalytic Reduction (SCR) -- In this process, ammonia (NH_3), usually diluted with air or steam, is injected through a grid system into the exhaust gas stream upstream of a catalyst bed. On the catalyst surface the NH_3 reacts with NO_x to form molecular nitrogen and water. The basic reactions are as follows:

$$4NH_3 + 4NO + O_2 \rightarrow 4N_2 + 6H_2O \text{ (i)}$$

$$8NH_3 + 6NO_2 \rightarrow 7N_2 + 12H_2O \text{ (ii)}$$

The reactions take place on the surface of the catalyst. Usually, a fixed bed catalytic reactor is used for SCR systems. The function of the catalyst is to effectively lower the technology include the catalyst reactor design, optimum operating temperature, sulfur content of the charge, catalyst deactivation due to aging, ammonia slip emissions and design of the ammonia injection system.

Depending on system design, NO_x removal of 80 - 90 percent may be achievable under optimum conditions (refer, USEPA "ACT Document - NO_x Emissions from Iron and Silicon productions", Sept., 1994). The reaction of NH_3 and NO_x is favored by the presence of excess oxygen. Another variable affecting NO_x reduction is exhaust gas temperature. The greatest NO_x reduction occurs within a reaction window at catalyst bed temperatures between 600 °F – 750 °F for conventional (vanadium or titanium-based) catalyst types, and 470 °F – 510 °F for platinum-based catalysts. Performance for a given catalyst depends largely on the temperature of the exhaust gas stream being treated. A given catalyst exhibits optimum performance when the temperature of the exhaust gas stream is at the midpoint of the reaction temperature window for applications where exhaust gas oxygen concentrations are greater than 1 percent. Below the optimum temperature range, the catalyst activity is greatly reduced, potentially allowing unreacted ammonia (referred to as "ammonia slip") to be emitted directly to the atmosphere.

The SCR system may also be subject to catalyst deactivation over time. Catalyst deactivation occurs through two primary mechanisms – physical deactivation and chemical poisoning. Physical deactivation is generally the result of either continual exposure to thermal cycling or masking of the catalyst due to entrainment of particulates or internal contaminants. Catalytic poisoning is caused by the irreversible reaction of the catalyst with a contaminant in the gas stream. Catalyst suppliers typically guarantee a 3-year catalyst lifetime for a sustainable emission limit.

In order for an SCR system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates, NO_x concentrations, and temperature. In addition, certain elements such as iron, nickel, chrome, and zinc can react with platinum catalysts to form compounds or alloys which are not catalytically active. These reactions are termed "catalytic poisoning", and can result in premature replacement of the catalyst. An SAF flue gas may contain a number of these catalytic poisons. In addition, any solid material in the gas stream can form deposits and result in fouling or masking of the catalytic surface. Fouling occurs when solids obstruct the cell openings within the catalyst. Masking occurs when a film forms on the surface of catalyst over time. The film prevents contact between the catalytic surface and the flue gas. Both of these conditions can result in frequent cleaning and/or replacement requirements. Due to the above effective technical applicability constraints, SCR technology has never been applied to silicon production operations, and will be eliminated for further evaluation in this BACT analysis.

(c) Non-Selective Catalytic Reduction (NSCR) - The NSCR system is a post-combustion add-on exhaust gas treatment system. It is often referred to as a "three-way conversion" catalyst since it reduces NO_x,

unburned hydrocarbons (UBH), and CO simultaneously. In order to operate properly, the combustion process must be stoichiometric or near stoichiometric which is not maintained in an SAF and varies widely under regular operation. Under stoichiometric conditions, in the presence of the catalyst, NO_x is reduced by CO, resulting in nitrogen and carbon dioxide. Currently, NSCR systems are limited to rich-burn IC engines with fuel rich ignition system applications. In view of the above limitations, the NSCR option is considered technically infeasible for this application and will not be considered any further in this BACT analysis.

(d) $SCONO_x$-Catalytic Oxidation/Absorption -- This is a catalytic oxidation/absorption technology that has been applied for reductions of NO_x, CO and VOC from an assortment of combustion applications that mostly include – small turbines, boilers and lean-burn engines. However, this technology has never been applied to silicon production operations.

An effective $SCONO_x$ application to a SAF has the following reservations:

(1) The technology is not readily adaptable to high-temperature applications outside the 300-700 °F range and is susceptible to thermal cycling that will be experienced in the MS Silicon application;

(2) Scale-up is still an issue. The technology has not been demonstrated for larger applications;

(3) Optimum $SCONO_x$ operation is predicated by stable gas flow rates, NO_x concentrations and temperature. As discussed earlier, the nature of SAF operations does not afford any of these conditions which will significantly impair the effective control efficiency of the $SCONO_x$ system;

(4) The catalyst is susceptible to moisture interference and the vendor indicates negation of its warranties and performance guarantees if the catalyst is exposed to any quantity of liquid water. However, during certain atmospheric conditions, the catalyst could be potentially exposed to moisture following a unit shutdown;

(5) The prospect of moving louvers that effect the isolation of the saturated catalyst readily lends itself to the possibility of thermal warp and in-duct malfunctions in general. The process is dependent on numerous hot-side dampers that must cycle every 10-15 minutes. Directional flow solutions are not yet known to have been implemented for this technology;

(6) The K_2CO_3 coating on the catalyst surface is an active chemical reaction and reformulation site which makes it particularly vulnerable to fouling. On some field installations, the coating has been found to be friable and tends to foul in the harsh in-duct environment;

(7) During the regeneration step, the addition of the flammable reducing gas (natural gas which contains 85% methane) into the hot flue gas generates the possibility of LEL exceedances and subsequently catastrophic failure in the event the catalyst isolation is not hermetic or there is a failure in the carrier steam flow; and

(8) There is a possibility of some additional SO_2 emissions if the dry scrubber with the tandem "guard-bed" $SCOSO_x$ unit experiences a malfunction. Thus, there are significant reservations regarding effective technical applicability of this control alternative for a silicon production SAF application. Moreover $SCONO_x$ technology has never been proposed nor successfully implemented for similar industry applications. In view of the above limitations, $SCONO_x$ is considered technically infeasible for the present application and will not be considered any further in this BACT analysis.