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Corrective Action Plan Revision 01
Hercules Incorporated
613 West 7th Street
Hattiesburg, Mississippi 39401

FILE COPY

Prepared for:

Hercules Incorporated
1313 North Market Street
Wilmington, Delaware 19894

Prepared by:

Groundwater & Environmental Services, Inc.
5961 Live Oak Parkway, Suite B
Norcross, Georgia 30093

Jeffery S. Duncan, P.G.
Senior Project Manager

20 January 2005

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1.0 INTRODUCTION

On behalf of Hercules Incorporated (Hercules), Groundwater and Environmental Services, Inc. (GES) has prepared this Corrective Action Plan (CAP) for the Hercules facility located at 613 West 7th Street in Hattiesburg, Mississippi. A Site Location Map is included as **Figure 1**.

This CAP has been prepared in response to the Mississippi Department of Environmental Quality (MDEQ) request in a letter dated 12 August 2004. The 12 August 2004 MDEQ letter and subsequent GES response letter dated 28 September 2004 provided further clarification on the 16 July 2004 Remedial Action Evaluation (RAE) and the implications on the preparation of this CAP. GES has incorporated the intent of these communications in this CAP.

1.1 BACKGROUND

As presented in the referenced RAE prepared by Eco-Systems, Inc. (Eco-Systems), the following provides a background summary of site investigations conducted at the facility.

Site investigations at the Hercules facility in Hattiesburg Mississippi, which were conducted between April 1999 and November 2003, are discussed in the *Interim Groundwater Monitoring Report* (Eco-Systems, January 2003), the *Hercules Site Investigation Report* (Eco-Systems, April 2003), and the *Supplemental Site Investigation Report* (Eco-Systems, November 2004). The findings of the site investigations include the following:

- Detection of volatile organic compounds (VOCs) in groundwater at concentrations above Target Remediation Goals (TRGs) in the Landfill and Groundwater areas of the site;
- Delineation of the lateral limits of the Landfill based on geophysical investigation;
- Presence of VOCs and Dioxathion at concentrations less than TRGs in surface water and sediment samples collected from Green's Creek, and;
- Presence of VOCs and Dioxathion in one of three groundwater monitoring wells located hydraulically downgradient of the sludge pits. It should be noted that Dioxathion has not been detected above the TRGs in this area.

Site investigations indicated that neither VOCs nor Dioxathion, are migrating via groundwater or surface water onto off-site properties. Some of the VOCs detected in Green's Creek were detected in samples collected from the location

where Green's Creek enters the property, which indicates that, at least, some of the VOCs are due to upstream, off-site, sources.

1.2 FACILITY SETTING AND OVERVIEW

As presented in the RAE prepared by Eco-Systems, the following presents the facility settings and overview.

The Hercules facility is located on approximately 200 acres of land north of West Seventh Street in Hattiesburg, Forest County, Mississippi. More specifically, the Site is located in Sections 4 and 5, Township 4 North, Range 13 West, just north of Hattiesburg, Mississippi **(Figure 1).** The facility has been in operation since 1923. The facility is bordered to the north by Highway 42 and beyond which is Illinois-Central & Gulf Railroad, along with various residential and commercial properties. The southern property boundary is bordered by 7th Avenue; and by Roseland Park cemetery and Zeon Chemical Corporation to the south-southwest. Across from these locations are residential areas. The eastern and western boundaries are bordered by sparsely populated residential and commercial areas.

The facility's historical operations consisted of wood grinding, shredding, extraction, fractionation, refining, distillation, and processing of rosin from pine tree stumps. Historically, over 250 products were produced from the above-referenced operations and included: modified resins, polyamides, ketene dimmer, crude tall oil wax emulsions, and Delnav, an agricultural miticide. Structures at the facility include offices, a laboratory, a powerhouse, production buildings, a wastewater treatment plant, settling ponds, a landfill, and central loading and packaging areas.

Previous investigations at the Hercules facility have centered on efforts to determine whether the miticide, Dioxathion, was present in site soil and groundwater. The work has included soil, groundwater, surface water, and stream sediment sampling and analysis. The work has also included geophysical investigation to delineate the limits of the landfill and to investigate the potential for buried metal in a location identified by the MDEQ. The results of previous investigations are discussed in reports, which have been submitted to the MDEQ:

1. *Site Inspection Report*, B&V Waste Science and Technology Corp., April, 1993.
2. *Work Plan for Well Installation*, Bonner Analytical Testing Company; June, 1997.
3. *Installation, Sampling, and Analysis Report*, Bonner Analytical Testing Company; December, 1997.

4. *Quarterly Monitor Well Sampling Event Reports*, Bonner Analytical Testing Company; June, 1998 through October, 1998.
5. *Site Investigation Work Plan*, Eco-Systems, Inc., February 1999.
6. *Interim Groundwater Monitoring Report*, Eco-Systems, Inc. January 2003.
7. *Site Investigation Report*, Eco-Systems, Inc. April 2003.
8. *Work Plan for Supplemental Site Investigation*, Eco-Systems, Inc. June 2003.
9. *Supplemental Site Investigation Report*, Eco-Systems, Inc. November 2003.
10. *Remedial Action Evaluation,* Eco-Systems, Inc. July 2004.

The information discussed in the listed documents indicates that sources, source area concentrations, and vertical and horizontal extent of groundwater containing constituents of concern have been defined sufficiently for corrective action planning purposes. The existing data does not indicate that the site poses a significant threat to human health and the environment in its current use as a chemical production facility. However, if changes in land use occur or additional information is obtained, the current risk scenario for the site could also change.

1.3 PURPOSE AND SCOPE

The purpose of this CAP is to present the regarding the reflected remedial option for each of the four areas of the site included in the RAE. The scope of this CAP is presented in the following sections:

- Section 2.0 presents the completed design per area;
- Section 3.0 presents the components per area;
- Section 4.0 presents the schedule for each component;
- Section 5.0 presents the Remedial Goals;
- Section 6.0 presents the Operation & Monitoring Plan for the fencing;
- Section 7.0 presents the Performance Monitoring Plan for MNA;
- Section 8.0 presents the Compliance Monitoring Plan for each area;
- Section 9.0 presents the Contingency Plan for each area;
- Section 10.0 presents Quality Assurance Project Plan considerations per area, and;
- Section 11.0 presents Health and Safety Plan considerations.

2.0 CONCEPTUAL DESIGN

The conceptual design of this CAP is comprised of Monitored Natural Attenuation (MNA) and institutional controls consisting of fencing and deed restrictions. There is limited historical groundwater quality data available for each of the areas included in this CAP. As such, it is necessary to collect a comprehensive round of groundwater samples for the period of one (1)-year prior to defining the MNA parameters to be analyzed and the wells to be sampled for MNA parameters. This will ensure that a MNA program is designed to be effective and cost-efficient. The specific conceptual design of each of the areas is included below.

2.1 SLUDGE PITS

For the sludge pits, this CAP presents MNA combined with a deed restriction to restrict future land use of the sludge pits and nearby surrounding areas and the maintenance of the existing chain-link fence surrounding the facility to limit current and future exposure to the Sludge Pits.

The MNA element of this design will provide monitoring to ensure that contaminated groundwater does not migrate at unacceptable levels from the sludge pits thereby eliminating or reducing risk to human health and the environment. Limiting current and future exposure to the Sludge Pits will eliminate or reduce risk to human health and the environment by preventing usage of the site for any purpose other than industrial.

2.2 LANDFILL

For the landfill, this CAP presents MNA combined with a deed restriction to restrict future land use in the landfill area.

The MNA element of this design will provide monitoring to ensure that contaminated groundwater does not migrate at unacceptable levels from the landfill thereby eliminating or reducing risk to human health and the environment. Limiting current and future exposure to the landfill area will eliminate or reduce risk to human health and the environment by preventing usage of the site for any purpose other than industrial.

2.3 *GROUNDWATER*

For Groundwater, this CAP presents MNA combined with deed restrictions to restrict future land use in the area of groundwater containing VOCs in excess of the TRGs.

The MNA element of this design will provide monitoring to ensure that contaminated groundwater does not migrate from the site at unacceptable levels thereby eliminating or reducing risk to human health and the environment. Limiting current and future exposure to the Groundwater area will eliminate or reduce risk to human health and the environment by preventing usage of the site for any purpose other than industrial.

2.4 *GREEN'S CREEK*

For Green's Creek, this CAP presents MNA combined with a deed restriction to restrict future land use of Green's Creek and the maintenance of the existing chain link fence surrounding the facility to limit current and future exposure to Green's Creek.

The MNA element of this design will provide monitoring to ensure that contaminated water does not migrate at unacceptable levels from Green's Creek thereby eliminating or reducing risk to human health and the environment. Limiting current and future exposure to Green's Creek will eliminate or reduce risk to human health and the environment by preventing usage of the site for any purpose other than industrial.

3.0 SYSTEM COMPONENTS

The primary components of this CAP consist of groundwater and surface water monitoring networks, deed restrictions and fencing. All work will be completed in accordance with the Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM) dated November 2001. Specifically, groundwater sampling via *low-flow/low-stress* purging and surface water sampling techniques will be completed in accordance with the methods described in the Work Plan Supplemental Site Investigation Report (Eco-Systems, June 2003) which was submitted to and approved by MDEQ. The locations of groundwater and surface water monitoring locations are presented on **Figure 2**. The analytical requirements by area are presented on **Table 1**. The specific components of each area are described below.

3.1 SLUDGE PITS

The components of this CAP for the Sludge Pits consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use;
- Maintenance of an existing chain-link fence around the facility and;
- Collection of groundwater samples from an existing monitoring well network consisting of MW-2, MW-3, MW-4, MW-10 and MW-11. The samples will be analyzed for VOCs via USEPA SW846-8260 and Dioxathion (cis- and trans-) and Dioxenethion via the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.

3.2 LANDFILL

The system components of this CAP for the Landfill consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use, and;
- Collection and analysis of groundwater samples from a monitoring well network consisting of existing wells MW-5 and MW-6 and proposed wells

MW-12, MW-13 and MW-14. The samples will be analyzed for VOCs via USEPA SW846-8260.

- Proposed monitoring wells MW-12, MW-13 and MW-14 will be installed as permanent two-inch diameter wells as follows:
    - Soil borings will be installed via; Hollow Stem Auger (HSA) drilling rig;
    - Permanent wells will be installed in the soil borings to bracket the observed water table with a 10-foot screened interval; which will be constructed to monitor the same water-bearing zone as monitoring wells MW-5 and MW-6.
    - The estimated total depths of these monitoring wells is 20-feet below ground surface.

3.3 GROUNDWATER

The components of this CAP for Groundwater consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use, and;
- Collection of groundwater samples from a monitoring well network consisting of existing monitoring wells MW-7, MW-8 and MW-9, proposed monitoring wells MW-15, MW-16 and MW-17 and proposed compliance wells MW-18 and MW-19. It should be noted that an additional well is proposed, for a total of three proposed new wells, so that permanent wells are installed at both locations of water samples collected from GP-2 and GP-4. The samples will be analyzed for VOCs via USEPA SW846-8260 and the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.
- Proposed monitoring wells MW-15 through MW-19 will be installed as permanent two-inch diameter wells as follows:
    - Soil borings will be installed via; Hollow Stem Auger (HSA) drilling rig;
    - Permanent wells will be installed in the soil borings to bracket the observed water table with a 10-foot screen interval; which will be

constructed to monitor the same water-bearing zone as monitoring wells MW-7, MW-8 and MW-9.

- The estimated total depths of those monitoring wells is 20-feet below ground surface.

3.4 GREEN'S CREEK

The components of this CAP for Green's Creek consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future land use;
- Maintenance of an existing chain-link fence around the facility, and;
- Collection and analysis of surface water samples from a surface water monitoring network consisting of CM-00 through CM-05. The samples will be analyzed for VOCs via USEPA SW846-8260 and .the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.

4.0 SCHEDULE

The CAP presented herein will be initiated upon approval by MDEQ. A groundwater monitoring schedule is presented as **Table 2**. An implementation schedule and duration of implementation for each component is described below.

4.1 DEED RESTRICTIONS

Deed restrictions for each of the four areas will be initiated within 30-days following the date in which the first round of groundwater sampling results are submitted to MDEQ. It is currently envisioned that the necessary documentation of the deed restrictions will be provided in the first annual CAP Implementation Report.

4.2 GROUNDWATER AND SURFACE WATER MONITORING

Implementation of groundwater and surface water monitoring well be implemented within 90-days following MDEQ's approval of this CAP. The monitoring will be completed on a quarterly basis for the period of two years. Quarterly sampling reports will be submitted within 45-days after the conclusion of each field sampling event. The quarterly reports will be inclusive of laboratory analytical reports, analytical summary and screening tables, and conclusions/recommendations regarding any necessary action during the next quarterly monitoring period. At the conclusion of eight (8) quarterly monitoring events, an evaluation of the need for further monitoring and a schedule for such monitoring will be proposed to MDEQ at that time.

5.0 *REMEDIAL GOALS*

The overall remedial goals (RGs) of this CAP are to restrict future land use via deed restrictions, limit current and future potential exposure via fencing and document long-term natural attenuation of groundwater constituents via MNA. The following presents the rationale for determining when the remedial goals have been achieved.

The RG of restricting future land use will be considered complete once the deed restrictions are complete and the supporting documentation has been provided to MDEQ.

The RG of limiting current potential exposure considered complete since existing fencing is protective of exposure to the Sludge Pits and Green's Creek. For the RG of limiting potential future exposure an inspection and maintenance will be implemented to ensure the integrity of the fencing.

The RG of documenting long-term natural attenuation of groundwater constituents will be considered complete once a sufficient amount of MNA data has been compiled and evaluated to support the that groundwater constituents are decreasing over time and the extent of the groundwater plume(s) are reducing in areal extent over time.

6.0 *OPERATION AND MONITORING PLAN*

The only component of this CAP that requires an Operation and Monitoring (O&M) requirement is inspection of fencing. Annual inspection and maintenance will be implemented to limit future potential exposure to these areas. Documentation of the annual inspection and maintenance will be included in Annual Monitoring Reports. Barring any unforeseen circumstances, any necessary repairs to the fencing will be completed within 90-days following any observance.

7.0 *PERFORMANCE MONITORING PLAN*

The CAP component that requires a Performance Monitoring Plan is MNA. MNA will be evaluated based on groundwater constituent concentrations and areal distribution of groundwater plume(s) over time.

Implementation of this Performance Monitoring Plan will be documented in quarterly monitoring reports that will be submitted to MDEQ within 45-days following the completion of each monitoring event (see Section 4.2). In addition, annual monitoring reports will be submitted to document the quarterly activities conducted during that year and will provide all data generated to date.

The annual monitoring reports will contain copies of the analytical reports, chain-of-custody forms, and a discussion of the data evaluation. Liquid-level data collected during groundwater sampling will be used to determine groundwater elevations and flow direction. The groundwater analytical data will be tabulated and screened against the MDEQ TRGs. Groundwater potentiometric and quality maps will be prepared for the main constituents detected in excess of their respective TRGs to facilitate an evaluation of groundwater plume areal extent over time. Groundwater constituent trend charts will be prepared to facilitate an evaluation of groundwater constituent concentrations over time.

8.0 COMPLIANCE MONITORING PLAN

During the implementation of this CAP, compliance monitoring for the MNA component will be conducted in each of these areas. The compliance monitoring is required to ensure that contingent actions are undertaken if a certain "trigger" is met. This "trigger" is identified as a detection of a contaminant at a concentration in excess of the MDEQ TRG concentrations in a downgradient well for three (3) consecutive sampling events.

Exceedance of this "trigger" could indicate the potential that groundwater contamination may be expanding or migrating from restricted use areas. As such, monitoring wells MW-6, MW-7, MW-9, MW-13 and MW-16 will also be considered during compliance monitoring evaluations in addition to the downgradient monitoring wells identified in the following subsections.

8.1 SLUDGE PITS

Compliance monitoring in the Sludge Pits area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-4, MW-10 and MW-11. The data generated from these monitoring wells will provide an evaluation of groundwater quality emanating from the Sludge Pits area and towards Green's Creek.

8.2 LANDFILL

Compliance monitoring in the landfill area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-5, MW-12 and MW-14. The data generated from these monitoring wells will provide an evaluation of groundwater quality emanating from the landfill area and towards Green's Creek.

8.3 GROUNDWATER

Compliance monitoring in the Groundwater area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-14 (landfill well) and MW-15. The data generated from these wells will provide an evaluation of groundwater quality emanating from the Groundwater area and towards Green's Creek.

8.4 GREEN'S CREEK

Compliance monitoring for Green's Creek will consist of evaluating the analytical data in downgradient surface water sampling locations CM-03, CM-04 and CM-05. The data generated from those surface water monitoring locations will provide an evaluation of surface water in the creek on-site and quality of surface water leaving the property. The data from these points will be compared to the upgradient monitoring points CM-00, CM-01 and CM-02.

9.0 CONTINGENCY PLAN

The following Contingency Plan has been prepared and will be enacted should the specific "trigger" condition identified in Section 8.0 is met. The overall contingency plan approach is that if MDEQ or Hercules suspects that a "trigger" condition has been met, a meeting will be held between both parties (and/or representatives) to facilitate an objective evaluation of the situation including; the data, the potential risk to human health and the environment, current technologies, prior to initiation of any of the specified contingency actions identified below. A specific plan for each area is described below.

9.1 SLUDGE PITS

Contingent measures will be necessary if it is determined that a "trigger" condition has been met in monitoring wells MW-4, MW-10 and MW-11. A "trigger" condition in these wells could indicate that a release of constituents from the Sludge Pits area may have occurred. If deemed necessary, the contingent plan for the Sludge Pits area consists of installation of the cap as detailed in the RAE.

Upon approval of this CAP, Hercules will purchase financial assurance in the amount of $758K to cover the costs of installing a cap on the Sludge Pits should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

9.2 LANDFILL

Contingent measures may be necessary if it is determined that a "trigger" condition has been met in monitoring wells MW-5, MW-12 and MW-14. A "trigger" condition in these wells could indicate that a release of constituents from the landfill area may have occurred. Pending an evaluation of the circumstances regarding a "trigger" condition, the contingent plan for the landfill area could consist of either *in-situ* chemical oxidation (ISCO) or the horizontal containment plan as detailed in the RAE.

9.3 GROUNDWATER

Contingent measures will be necessary if it is determined that a "trigger" condition has been met in monitoring wells MW-5, MW-12 and MW-14. A

"trigger" condition in these wells could indicate that a significant source of groundwater constituents is present in the Groundwater area. If deemed necessary, the contingent plan for the Groundwater consists of ISCO as detailed in the RAE.

Upon approval of this CAP, Hercules will purchase financial assurance in the amount of $669K to cover the costs of implementing ISCO in the Groundwater area should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

9.4 GREEN'S CREEK

Contingent measures will be necessary if it is determined that a "trigger" condition has been met in downgradient surface water monitoring points CM-03, CM-04 and CM-05. However, the concentrations in CM-03, CM-04 and CM-05 will be compared to the constituents observed in upgradient surface water points CM-00, CM-01 and CM-2 prior to concluding that a "trigger" condition has been met. A sustained significant increase in constituent concentrations in the downgradient surface water monitoring points would indicate that a release of constituents from the Sludge Pits area may have occurred. If deemed necessary, the contingent plan for Green's Creek will consist of addressing the Sludge Pits area as detailed in Section 9.1.

As previously discussed, upon approval of this CAP, Hercules will purchase financial assurance in the amount of $758K to cover the costs of installing a cap on the Sludge Pits should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

10.0 *QUALITY ASSURANCE PROJECT PLAN*

The following Quality Assurance Project Plan (QAPP) considerations have been prepared for the MNA component of this CAP. Specifically, these considerations have been made to assure the quality of the analytical data to be generated is sufficient to be used to evaluate groundwater quality trends and ensure that implementation of the CAP is protective of human health and the environment. All work will be completed in accordance with the Quality Provisions of SW846 QA/QC Protocol and EPA Region IV EISOPQA dated November 2001.

The following field sampling QAPP considerations will be followed:

- Blind Field Duplicate samples will be collected at the rate of 1 per 10 samples;
- Equipment field rinsate samples will be collected at the rate of 1 per field day per non-disposable equipment used;
- Trip blank samples will be analyzed at the rate of 1 per cooler containing samples for VOC analysis.

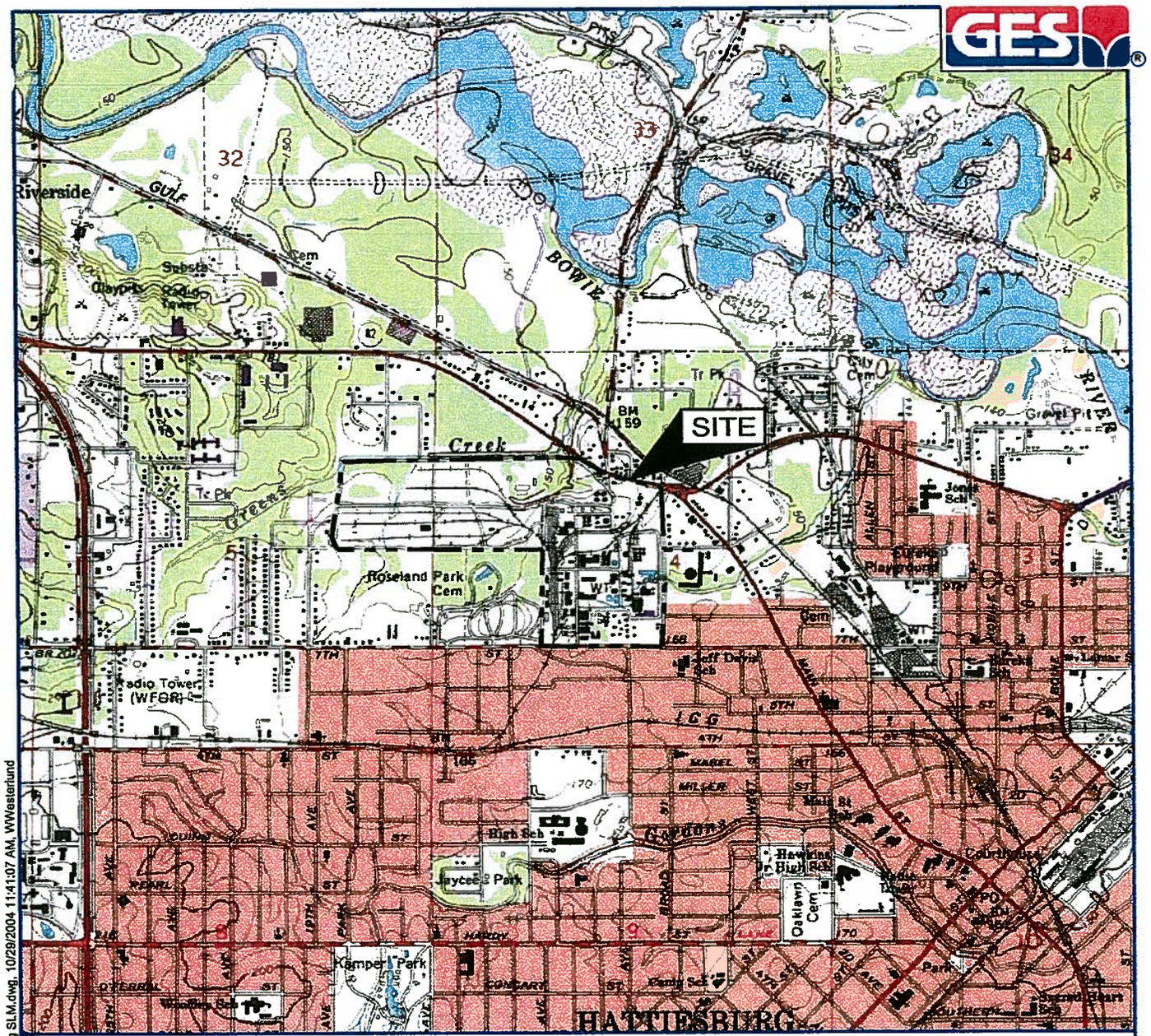
The results of these samples will be tabulated and included in the Annual Monitoring Reports.

The Data Quality Objectives (DQOs) for the groundwater data generated during implementation of this CAP will be the TRGs. The groundwater analytical parameter list is provided as **Table 3**. This table also presents the TRGs and the respective laboratory analytical reporting limits. For those compounds where the screening criteria are lower than the report limit (RL), the method detection limit (MDL) will be used. If detections are made between the RL and the MDL, the resulting detection will be j-flagged indicating that the detection is estimated. It should be noted, that this table also presents (in bold) the compounds with MDLs that exceed the TRGs.

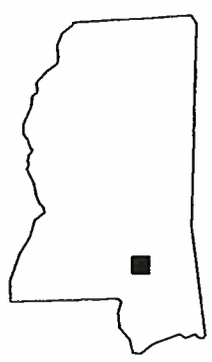
11.0 HEALTH AND SAFETY PLAN

A Health & Safety Plan (HASP), consistent with the requirements of OSHA 1910.120 Hazardous Waste Operations (Hazwoper) that has been prepared and followed by Eco-Systems, Inc. is included as Appendix B. The consultant(s) chosen to implement the CAP will be required to submit their own HASP to Hercules and MDEQ prior to the implementation of the CAP. In addition, all field personnel and subcontractors will be required to attend a Hercules Incorporated site-specific health and safety training meeting prior to commencement of field activities.

Figures



SOURCE: USGS 7.5 MINUTE SERIES
TOPOGRAPHIC QUADRANGLE 1982
HATTIESBURG, MISSISSIPPI
CONTOUR INTERVAL = 10'



QUADRANGLE LOCATION

LAT. 031° 20' 24.78" N
LONG. 089° 18' 28.22" W
(APPROXIMATE SITE COORDINATES)

DRAFTED BY: W.A.W. (N.J.)	SITE LOCATION MAP
CHECKED BY:	HERCULES INCORPORATED 613 WEST 7th STREET HATTIESBURG, MISSISSIPPI
NORTH	Groundwater & Environmental Services, Inc. 5961 LIVE OAK PKWY, SUITE B, NORCROSS, GEORGIA 30093

SCALE IN FEET	DATE	FIGURE
0 — 2000	10-29-04	1

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Tables

Tables

Table 1
Analytical Requirements by Area
Hercules Incorporated Facility
Hattiesburg, Mississppi

Area	Analytical Requirements	Analytical Method
Sludge Pits	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans-), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis
Landfill	(1) Appendix IX Volatile Organic Compounds	(1) SW846-8260
Groundwater	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis
Green's Creek	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans-), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis

Table 2
Groundwater Monitoring Schedule
Hercules Incorporated Facility
Hattiesburg, Mississippi

Monitoring Location	Sample Classification	Initial Monitoring Schedule
	Liquid Levels	
Piezometers		
TP-3	Groundwater Elevation	Quarterly
TP-4	Groundwater Elevation	Quarterly
TP-5	Groundwater Elevation	Quarterly
TP-6	Groundwater Elevation	Quarterly
TP-7	Groundwater Elevation	Quarterly
TP-11	Groundwater Elevation	Quarterly
Monitoring Wells		
MW-2	Groundwater Elevation	Quarterly
MW-3	Groundwater Elevation	Quarterly
MW-4	Groundwater Elevation	Quarterly
MW-5	Groundwater Elevation	Quarterly
MW-6	Groundwater Elevation	Quarterly
MW-7	Groundwater Elevation	Quarterly
MW-8	Groundwater Elevation	Quarterly
MW-9	Groundwater Elevation	Quarterly
MW-10	Groundwater Elevation	Quarterly
MW-11	Groundwater Elevation	Quarterly
MW-12	Groundwater Elevation	Quarterly
MW-13	Groundwater Elevation	Quarterly
MW-14	Groundwater Elevation	Quarterly
MW-15	Groundwater Elevation	Quarterly
MW-16	Groundwater Elevation	Quarterly
MW-17	Groundwater Elevation	Quarterly
MW-18	Groundwater Elevation	Quarterly
MW-19	Groundwater Elevation	Quarterly
Green's Creek Staff Gauges		
SG-1	Groundwater Elevation	Quarterly
SG-2	Groundwater Elevation	Quarterly
SG-3	Groundwater Elevation	Quarterly
SG-4	Groundwater Elevation	Quarterly

Table 2
Groundwater Monitoring Schedule
Hercules Incorporated Facility
Hattiesburg, Mississippi

Monitoring Location	Sample Classification	Initial Monitoring Schedule
Groundwater Sampling		
Sludge Pits		
MW-2	Upgradient Well	Quarterly
MW-3	Upgradient Well	Quarterly
MW-4	Downgradient Well	Quarterly
MW-10	Downgradient Well	Quarterly
MW-11	Downgradient Well	Quarterly
Landfill		
MW-5	Downgradient Well	Quarterly
MW-6	Upgradient Well	Quarterly
MW-12 *P*	Upgradient Well	Quarterly
MW-13 *P*	Upgradient Well	Quarterly
MW-14 *P*	Downgradient Well	Quarterly
Groundwater		
MW-7	Upgradient Well	Quarterly
MW-8	Downgradient Well	Quarterly
MW-9	Upgradient Well	Quarterly
MW-15 *P*	Downgradient Well	Quarterly
MW-16 *P*	Downgradient Well	Quarterly
MW-17 *P*		
MW-18 *P*	Point of Compliance Well	Quarterly
MW-19 *P*	Point of Compliance Well	Quarterly
Green's Creek		
CM-00	Upgradient Surface Water	Quarterly
CM-01	Upgradient Surface Water	Quarterly
CM-02	Upgradient Surface Water	Quarterly
CM-03	Downgradient Surface Water	Quarterly
CM-04	Downgradient Surface Water	Quarterly
CM-05	Downgradient Surface Water	Quarterly

Notes:
~ No Analytical Data Available
P - Proposed Monitoring Well
Initial Monitoring Schedule proposed for the first 2 years of CAP implementation

Table 3
Screening Criteria and
Reporting Limits
Hercules Incorporated Facility
Hattiesburg, Mississippi

Sample ID	MDEQ TRGs	Reporting Limit[1]
Appendix IX Volatile Organic Compounds (VOCs) *Method SW8260B* (ug/L)		
Acetone	608	25
Acetonitrile	125	40
Acrolein (Propenal)	0.0416	10
Acrylonitrile	0.0367	5.7
Benzene	5	1.0
Bromodichloromethane	0.168	0.14
Bromoform	8.48	1.0
Bromomethane (Methyl bromide)	8.52	1.0
2-Butanone (Methyl ethyl ketone)	1,910	10
Carbon disulfide	1,040	1.0
Carbon tetrachloride	5	1.0
Chlorobenzene	100	1.0
Chloroethane	3.64	1.0
Chloroform	0.155	0.37
Chloromethane (Methyl Chloride)	1.43	1.0
Chloroprene (1,3 Butadiene)	0.00696	1.0
3-Chloroprene (Allylchloride)	1.43	1.0
Dibromochloromethane	0.126	0.5
1,2-Dibromo-3-chloropropane	0.2	0.47
1,2-Dibromoethane (EDB)	0.0500	0.39
Dibromomethane (Methylene bromide)	60.8	1.0
trans-1,4-Dichloro-2-butene	0.00135	0.78
Dichlorodifluoromethane	348	1.0
1,1 Dichloroethane	798	1.0
1,2 Dichloroethane	5	1.0
1,1 Dichloroethene	7	1.0
cis-1,2 Dichloroethene	70	1.0
trans-1,2 Dichloroethene	100	1.0
1,2 Dichloropropane	5	1.0
cis-1,3-Dichloropropene	0.0842	1.0
trans-1,3-Dichloropropene	0.0842	1.0
Ethylbenzene	700	1.0
Ethyl methacrylate	548	1.0
2-Hexanone	1,460	10
Iodomethane (Methyl iodide)	~	1.0
Isobutanol (Isobutyl alcohol)	~	40
Methacrylonitrile	1.04	20
Methylene chloride (Dichloromethane)	5	5
Methyl methacrylate	1,420	1.0
4-Methyl-2-pentanone	139	10
Pentachloroethane	~	5
Propionitrile	~	20
Styrene	100	1.0
1,1,1,2-Tetrachlorethane	0.406	0.26
1,1,2,2-Tetrachlorethane	0.0527	0.18
Tetrachloroethene	5	1.0
Toluene	1,000	1.0
1,1,1-Trichloroethane	200	1.0
1,1,2-Trichloroethane	5	1.0
Trichloroethene	5	1.0
Trichlorofluoromethane	1,290	1.0
1,2,3-Trichloropropane	0.00623	0.61
Vinyl acetate	412	2.0
Vinyl chloride	2	1.0
Xylenes, total	10,000	2.0
Additional Parameters *Method SW846 3510C* (ug/L)		
Dioxenethion	~	0.400
Dioxathion (cis)	54.8	0.400
Dioxathion (trans)	54.8	0.400

Notes:
~ = not available or not applicable
Screening Criteria = MDEQ, Final Regulations Governing Brownsfield Voluntary Cleanup and Redevelopment in Mississippi (amended 28 Feb 2002), Appendix A, Tier 1 Target Remedial Goal
[1] For compounds where Reporting Limit > Screening Criteria, the Method Detection Limit is used
bold = method detection limit exceeds screening criteria

Appendix A

Appendix A

Dioxathion Sampling and Analysis Protocol

SAMPLING AND ANALYSIS PROTOCOL FOR THE DETERMINATION OF DIOXATHION IN WATER

Recent results of analyses of well water samples from the Hercules Incorporated plant in Hattiesburg, Mississippi, have exhibited a wide range in the levels of dioxathion reported. Discussions among representatives from the analytical laboratories demonstrated that the samples analyzed to date were not true split samples and that the analytical methods were applied differently. In order to minimize the effects from different water samples and from inconsistent application of the analytical methods, the following protocol has been assembled by agreement between Hercules Incorporated and the Mississippi State Chemical Laboratory. This protocol will be used in a study to determine the proper sampling and analysis methods to be used for all future water monitoring programs at the Hattiesburg plant.

1.) SAMPLE COLLECTION

Water samples will be withdrawn from the well using a Teflon bailer. The contents of the bailer will be placed into a large glass or Teflon container (one gallon, or more, in size). The container should have a Teflon-lined screw cap. Successive bailers of water will be removed from the well and placed into the container until there is enough water to supply split samples to each laboratory participating in the study. The contents of the large container will then be mixed thoroughly. After the composited water sample in the large container has been mixed, equal amounts of water will be poured into each sample jar. The sample jars should have Teflon-lined screw caps. This procedure will be repeated for each well.

Each analytical batch of a given matrix (up to 20 samples) will require the analysis of a method blank, Laboratory Control Standard (LCS), Matrix Spiked sample (MS) and Matrix Spike Duplicate (MSD). Alternately , a duplicated sample may be substituted for the (MSD). The MS and the MSD are counted as part of the analytical batch (aka Sample Delivery Group) which may be held open for up to seven (7) days.

Water samples collected from Wells #1, #4 and #5 will be submitted in duplicate to each laboratory. That is, two separate sample jars from Well #1, Well #4 and Well #5 will be filled and sent to each laboratory for analysis.

NOTE: The sample collected for the MS/MSD will require six (6) one-liter samples.

2.) EXTRACTION OF SAMPLES

All samples will be extracted with methylene chloride following the details described in the latest revision of U.S. EPA SW-846 Method 3510 C. The solvent should be exchanged into hexane, and all extracts will be adjusted to a final volume of ten milliliters (10 mL) before analysis.

3.) CLEANUP OF EXTRACTS

In order to minimize interferences in the determination of dioxathion, sample extracts that appear to contain interferences will be cleaned up using the latest revision of U.S. EPA SW-846 Method 3620, Florisil Cleanup. The volume of eluting solvent necessary for quantitative recovery of dioxathion from the Florisil column will be determined in each laboratory using the dioxathion and dioxenethiol reference standards supplied for calibration of the GC methods.

4.) SULFUR CLEANUP

If there is significant interference from sulfur compounds, the extracts may be cleaned up according to U.S. EPA SW-846 Method 3660, copper option.

5.) ANALYSIS OF EXTRACTS

Previous work performed by Bonner Analytical and Testing (BATCO) has revealed that trans dioxathion undergoes thermal degradation in the Gas Chromatograph column therefore the protocol is changed to a lower temperature analytical method. For All sample extracts will be analyzed by High Performance Liquid Chromatography (HPLC)) using a Photo Diode Array (PDA), operated in . U.S. EPA SW-846 Method 8321 A will be used as general guidance for HPLC methodology. . A five-point calibration curve will be used to calculate the results of analyses. The lowest point on the calibration curve should be equal to, or slightly higher than, the limit of detection of the GC-PDA system. The highest point on the calibration curve should be the end of the linear portion of the PDA response profile. All laboratories will follow the QA/QC criteria described in the analytical method. Those results will be stored at each laboratory for review at a later date, if necessary.

Instrumentation

HPLC – Hewlett Packard Model 10980 Series II Liquid Chromatograph with Diode Array Detector
Fluoresence Detector Hewlett Packard Series 1100 HPLC Column:
Supelco Discovery C18, 250 mm X 4.6 mm ID, 5 µm Particle Size.

Method Parameters

Mobile Phase : Isocratic, 30% Deionized water and 70 % Acetone
Flow: 1.2 mls/min
Injection Volume: 25 µLs
Run Time: 20 Minutes
Oven Temperature 35 °C
Detector Wavelengths
Diode Array: Excitation at 200, 210 and 270 nms
Fluorescence: Excitation at 250 nms, Emission at 410 nms

Surrogate/Internal Standards: A surrogate will be chosen that does not coelute with any dioxathion isomer. Internal standards may or may not be used.

6.) CONFIRMATION OF ANALYSES

The preferred method for qualitative and quantitative confirmation of dioxathion and dioxenethiol is Liquid Chromatography/Mass Spectra analysis (LC/MS), however the present time Bonner Analytical and Testing does not own an LC/MS instrument. Therefore, for qualitative and quantitative confirmation of the dioxathion results, all sample extracts will be analyzed by Bonner Analytical and Testing using gas chromatography-mass spectrometry (GC-MS) using the latest revision of U.S. EPA SW-846 Method 8270, or an equivalent mass spectrometry system that is deemed appropriate to give equivalent results. A five-point calibration curve will be used to calculate the results of analyses. The lowest point on the calibration curve should be equal to, or slightly higher than, the limit of detection of the GC-MS system. The highest point on the calibration curve should be the end of the linear portion of the MS detector response profile. All laboratories will follow the QA/QC criteria described in the analytical method. Those results will be stored at each laboratory for review at a later date, if necessary. If significant differences are observed between Bonner Analytical & Testing's results and Mississippi States University Chemical Laboratory'results, BATCO will send the extracts of these samples to a third party laboratory to investigate the reasons for these differences.

GC column: 30-meter X 0.25-mm (or 0.32-mm) DB-5 fused silica capillary column, as specified in Paragraph 4.1.2 in U.S. EPA SW-846 Method 8270.

GC oven and injector conditions: As specified in Paragraph 7.3 in SW-846 Method 8270.

The specifications given in Method 8270, Section 4.0, "APPARATUS AND MATERIALS," and Section 5.0, "REAGENTS," will be followed. The guidance in Section 7.0, "PROCEDURE" will be used to perform the GC separations and GC/MS identification and quantitation. Specific criteria for peak identification are given in Section 7.6 of the method. The characteristic ions, both primary and secondary ions, listed in Table 1 of the method will be used. For cis and trans dioxathion and dioxenthiol, the primary ion is m/z 97 with secondary ions at m/z 125, 270, and 153. Instrument tuning criteria are given in Table 3 of the method. For the Internal Standard, chrysene-d_{12} is recommended because it meets the retention time criteria set forth in Section 7.3.2.

7.) GENERAL COMMENTS

a.) All samples will be extracted and analyzed within the normal holding times for organophosphorus compounds.

b.) The dioxathion standard to be used by all laboratories will be supplied by the Hercules Incorporated.

c.) Water samples spiked with cis or trans dioxathion or dioxenethiol will be prepared by the Mississippi State Department of Environmental Quality (MSDEQ) personnel and distributed to each laboratory for inclusion in this study.

d.) Within three weeks of receipt of samples, all results of analyses and all confirmatory results will be reported to MSDEQ, who will collate them and distribute the results to the participating laboratories.

e.) A meeting will be held to review the results of analyses and to decide the next step in the implementation of the analytical methods to be used in monitoring well water samples from the Hercules Incorporated Hattiesburg plant.

f.) After its approval of this sampling and analysis protocol, MSDEQ will determine the time frame for the completion of all sampling and analysis activities and will set the date and time of the review meeting.

g.) Only results greater than or equal to the Limit of Quantitation will be reported. The numerical sum of the cis and trans isomers of dioxathion will be reported as dioxathion. Dioxenethiol will be reported as separate compound.

Appendix B

Appendix B

Health and Safety Plan

ESI

HEALTH AND SAFETY PLAN
REMEDIAL INVESTIGATIONS

HERCULES, INC.
HATTIESBURG, MISSISSIPPI

Prepared for:

HERCULES, INC.
HATTIESBURG, MISSISSIPPI

MAY 2004

Prepared by:

Eco-Systems, Inc.
Consultants, Engineers, and Scientists

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Figure 1 Hospital Route

APPENDICES

Appendix A Heat Stress Casualty Prevention Plan
Appendix B Safety Guidelines for Drillings
Appendix C Material Safety Data Sheets
Appendix D Site Safety Meeting Report Form
Appendix E Health and Safety Incident Report Form
Appendix F Emergency Services/Phone Numbers and Route to the Hospital

1.0 PROJECT IDENTIFICATION

Client:	Hercules, Inc.
Project:	Remedial Investigation
Project Manager:	Charles Coney
Project Number:	HER24100
Date of Plan:	5/24/04
Estimated Dates of Work:	May – June 2004
Expiration Date:	December 2004

2.0 INTRODUCTION

This Health and Safety Plan (HSP) establishes guidelines and requirements for the safety of field personnel during the conduct of the field activities associated with the referenced project. The specific activities addressed by this plan are defined in Section 3.0. All employees of Eco-Systems, Inc. (Eco-Systems) and their subcontractor, Singley Environmental Services, Inc. of Columbia, Mississippi, involved in this project are required to abide by the provisions of this plan. They are required to read this plan and sign the attached Compliance Agreement.

The health and safety guidelines and requirements presented are based on a review of available information and an evaluation of potential hazards. This plan outlines the health and safety procedures and equipment required for activities at this site to minimize the potential for exposures of field personnel. This plan may be modified by the Project Manager with the approval of the Health and Safety Officer in response to additional information obtained regarding the potential hazards to field investigative personnel.

2.1 PURPOSE

Hercules, Inc. contracted with Eco-Systems in to investigate areas of environmental concern at Hercules, Inc. facility located in Hattiesburg, Mississippi. The objective of this investigation will be to collect and analyze soil samples for geotechnical parameters.

2.2 SITE DESCRIPTION OF INVESTIGATIVE AREAS

The investigative area will encompass the entire site of the Hercules facility. The site includes open areas, production areas, wooded areas, and small stream.

2.4 PREVIOUS CHARACTERIZATION WORK

Several site investigations have previously been performed. One investigation was performed by EPA contractor, and covered hazardous substance scans of hazardous substances in surface soils and stream sediments. A later investigation installed monitoring wells and sampled groundwater.

2.5 KEY PERSONNEL

2.5.1 Eco-Systems Project Manager

For this project, the Eco-Systems Project Manager has the following responsibilities:

- To see that the project is performed in a manner consistent with the Eco-Systems Health and Safety Program.
- To have an approved Health and Safety Plan prepared and properly implemented for this project.
- To provide the Eco-Systems Health and Safety Officer with project information related to health and safety matters and development of the Health and Safety Plan.
- To implement the Health and Safety Plan.
- To insure compliance with the Health and Safety Plan by Eco-Systems and contractor personnel.
- To coordinate with the Eco-Systems Health and Safety Officer on health and safety matters.

The Eco-Systems Project Manager has the authority to take the following actions:

- To determine matters relating to schedule, cost, and personnel assignments on hazardous waste management projects.
- To temporarily suspend field activities, if the health and safety of personnel are endangered, pending further consideration by the Health and Safety Officer.
- To temporarily suspend an individual from field activities for infractions of the Health and Safety Plan, pending further consideration by the Health and Safety Officer.

2.5.2 Eco-Systems Health and Safety Officer

The Eco-Systems Health and Safety Officer has the following responsibilities:

- To interface with the Eco-Systems Project Manager as may be required in matters of health and safety
- To develop a Health and Safety Plan for the project.

- To appoint or approve a Eco-Systems Site Safety Officer to assist in implementing the Health and Safety Plan.
- To monitor compliance with the approved Health and Safety Plan.
- To assist the Eco-Systems Project Manager in seeing that proper health and safety equipment is available for the project.
- To approve personnel to work on this site with regard to medical examinations and health and safety training.

The Eco-Systems Health and Safety Officer has the authority to take the following actions:

- To suspend work or otherwise limit exposures to personnel, if a Health and Safety Plan appears to be unsuitable or inadequate.
- To direct personnel to change work practices, if they are deemed to be hazardous to health and safety of personnel.
- To remove personnel from the project, if their actions or condition endangers their health and safety or the health and safety of co-workers.

2.5.3 Eco-Systems Site Safety Officer

Eco-Systems Site Safety Officer: Charles Coney (To be designated prior to commencement of work)

The Eco-Systems Site Safety Officer has the following responsibilities:

- To direct health and safety activities onsite.
- To report safety-related incidents or accidents to the Eco-Systems Project Manager or Health and Safety Officer, and the Hercules, Inc. Facility Supervisor.
- To assist the Eco-Systems Project Manager in all aspects of implementing the Health and Safety Plan.
- To maintain health and safety equipment onsite, as specified in the Health and Safety Plan.
- To perform health and safety activities onsite, as specified in the Health and Safety Plan, and report results to the Eco-Systems Project Manager and Health and Safety Officer.

3.0 WORK PLAN

A separate work plan has been prepared for this project which details the investigative sampling methods and procedures.

4.0 HAZARD ASSESSMENT

4.1 BIOLOGICAL HAZARDS

If clearing has not been conducted or if biological hazards develop during work activities, practical guidelines for prevention of exposure to pests should be implemented.

4.2 HEAT STRESS HAZARDS

If heat stress becomes a concern, the heat stress casualty prevention plan attached as Appendix A shall be implemented.

4.3 PHYSICAL HAZARDS

There is a risk of physical injury resulting from misuse of the drilling equipment at the site. Use of steel toe and shank boots will be required when using or in the vicinity of heavy equipment. Personnel should be cognizant of the fact that when protective equipment such as respirators, gloves, and protective clothing are worn while using heavy equipment, visibility, hearing, and manual dexterity are impaired. Safety guidelines for drilling operations are attached as Appendix B.

Noise hazards may also be presented from drilling operations. Personnel exposed to noise levels in excess of permissible noise exposures as defined by 29 CFR 1910.95 shall be protected. Where feasible, administrative or engineering controls shall be utilized. If control measures are not effective or until controls are implemented, personnel shall wear approved personal protective equipment in the form of ear plugs or muffs.

Personnel who are exposed to a time weighted average of greater than 85dBA shall be required to participate in a hearing conservation program as defined by 29 CFR 1910.95.

4.4 CHEMICAL HAZARDS

Specific chemical hazards associated with this site include: Dioxathion and isopropyl alcohol. Chemical safety data sheets for these chemicals are attached as Appendix C. The primary route of exposure for these chemicals is: dermal (skin) with the secondary routes being (ingestion and possible inhalation, although not expected due to the low vapor pressure of these compounds and contaminated dust). As a result of these potential exposures, a modified Level D personal protective equipment (PPE) will be required during subsurface and sample handling activities. A potential upgrade to Level C PPE (respiratory protection) will be required if air monitoring action

levels are exceeded. Specific PPE ensembles associated with the various site activities are listed in Section 5.2. Air monitoring action levels are listed in Table 8.1. Air monitoring exposure limits are listed in Table 4.1 below.

TABLE 4.1
EXPOSURE LIMITS FOR POTENTIAL CONTAMINANTS
AT THE PROPOSED WORK SITES

Contaminant	TLV (mg/m^3)	PEL (mg/m^3)	STEL (mg/m^3)	IDLH (mg/m^3)	Skin Hazard
Dioxathion	ND	ND	ND	ND	

ND = No Data
CA = Potential Human Carcinogen (No IDLH level established)

Note: TLV – 0.2mg/m^3 (skin) (ACGIH 1991-1992)
Insoluble in Water

5.0 GENERAL HEALTH AND SAFETY REQUIREMENTS

5.1 WORK ZONES

During activities conducted in modified Level D PPE, the setup of work zones as defined by U. S. EPA will not be required. Although, management of this project shall be conducted in a manner which will restrict access to the job site by unauthorized personnel. If Level D action levels establish in Table 8.1 are exceeded resulting in an upgrade to Level C PPE, work zones as described in the following paragraphs shall be implemented.

To minimize the movement of contaminants from the site to uncontaminated areas, three work zones will be set up during activities conducted under Level C PPE. The three work zones will include the following:

Zone 1: Exclusion Zone
Zone 2: Contamination Reduction Zone
Zone 3: Support Zone

The exclusion zone is the zone where contamination does or could occur. The exclusion zone will be defined initially by a 20 x 20-foot area around the drill rig. Air monitoring and observation by the site safety officer will determine the extent of the zones. All persons entering this zone must wear at a minimum the level of protection set forth in Section 5.2 (Level C PPE).

Between the exclusion zone and support zone is the personnel contamination reduction zone (CRZ) which provides a transition zone between the contaminated and clean areas of the site.

This zone will be located directly outside of the exclusion zone and will be defined as a 10-foot zone directly outside the exclusion zone.

The support zone will be an uncontaminated area from which operations will be directed. It is essential that contamination from the site be kept out of this area. Included in this area will be a storage area for decontaminated clothing, additional personal protective equipment, etc.

5.2 Safety Equipment Required

The following personal protective equipment will be required for personnel engaged in field activities at the site:

Mobilization - Level D Protection

- Boots, steel toe and shank
- Hard hat
- Safety glasses with side shields

Subsurface and Sample Handling Activities/Decontamination Procedures - Modified Level D Protection

- Coveralls, chemical resistant; polycoated tyvek
- Gloves (outer), chemical-resistant, nitrile rubber
- Gloves (inner), chemical-resistant, latex.
- Boots, chemical-resistant, steel toe and shank (or bootie covers)
- Hard hat (with faceshield if splash hazard exists)
- Safety glasses with side shields
- Ear plugs or ear muffs (during drilling operations)

Level C Protection

- Half-face air purifying respirator with combination organic vapor/dust/fumes/mists/HEPA filter cartridges
- Coveralls, chemical-resistant; polycoated tyvek

- Gloves (outer), chemical-resistant; nitrile rubber
- Gloves (inner), chemical-resistant; latex
- Boots, chemical-resistant; steel-toe and shank (or bootie covers)
- Hard hat (with face shield if splash hazard exists)
- Safety glasses with side shields
- Ear plugs or ear muffs (during drilling operations)

When work is conducted over the pond, all sampling personnel shall also wear a coastguard approved life jacket and life line.

5.3 DECONTAMINATION PROCEDURES

5.3.1 Equipment Decontamination

All equipment used to collect soil and water samples will be decontaminated by the following procedure:

1. Washing in a detergent solution (Liquinox™)
2. Triple rinsing with clean deionized water
3. Air drying
4. Wrap in aluminum foil

Decontamination of equipment shall be conducted in Modified Level D PPE as listed in Section 5.2.

In the case of the shallow soil borings, decontamination between sampling intervals will be performed to preclude vertical cross-contamination between sample intervals. An alternative to decontamination of equipment within the same boring (between sample intervals) will be to utilize new augers, stems, etc., for each sampling interval, thereby requiring decontamination between boring locations only.

5.3.2 Personnel Decontamination

Decontamination of personnel will be performed at a designated location at the perimeter of the work area. Decontamination will consist primarily of soap and water washings and water rinse of exterior protective gear to remove contaminants, followed by doffing of the gear.

Coveralls should be removed by turning the clothing inside out. A general sequence of doffing procedures is outlined below. The extent of washing required, or modifications to the sequence, may be specified as appropriate.

Steps in decontamination will be as follows:

- Wash and rinse outer protective coverall
- Wash work gloves and boots
- Remove outer protective clothing
- Rinse respirator
- Wash hands and face

Contaminated disposable PPE and all decontamination fluids shall be containerized onsite for subsequent disposal by the direction of the Hercules, Inc.

5.4 MEDICAL EXAMINATION

Before commencing any of the field or laboratory activities defined in Section 3.0, all Eco-Systems personnel must take an annual Eco-Systems-approved medical examination as part of Eco-Systems' medical surveillance program.

5.5 COMPLIANCE AGREEMENT

The Eco-Systems Project Manager and Health and Safety Officer shall hold meetings with all Eco-Systems field personnel before work commences. During the meeting, all personnel shall be provided with a copy of this safety plan; the plan shall be reviewed and discussed and questions answered. Signed Compliance Agreement Forms shall be collected by the Eco-Systems Project Manager and filed by the Health and Safety Officer. Individuals refusing to sign the form will not be allowed to work on the site.

5.6 PROJECT MANAGER NOTIFICATION

All Eco-Systems field personnel must inform the Eco-Systems Project Manager or his/her designated representative before entering the site. At least two members of the field crew must be on site whenever work is performed. Personnel must be in visual contact with each other or carry two-way radios at all times.

If any drums or other previously unidentified potential hazards are discovered during any field work, immediately notify the Eco-Systems Project Manager for further instructions.

5.7 PROJECT SAFETY LOG

A project safety log will be used to record the names, entry and exit dates and times of all Eco-Systems and subcontractor personnel and of project site visitors; accidents, injuries, and illnesses; incidence of safety infractions by field personnel; air quality and personal exposure monitoring data; and other information related to safety matters. All accidents, illnesses or other incidences shall be reported immediately to the Eco-Systems Project Manager, and the Eco-Systems' Health and Safety Officer and subsequently documented for filing on the Incident Report Form attached as Appendix E.

5.8 PROHIBITIONS

- Smoking, eating, drinking, chewing gum or tobacco, storing food or food containers shall not be permitted on the work site. Good personal hygiene should be practiced by field personnel to avoid ingestion of contaminants or spread of contaminated materials.
- Ignition of flammable liquids within, on, or through improvised heating devices or space heaters.
- Approach or entry into areas or spaces where toxic or explosive concentrations of gases or dust may exist without proper equipment available to enable safe entry.
- Conduct of onsite operations without offsite backup personnel.

5.9 SITE SAFETY MEETING

Each day prior to commencement of work, a safety meeting will be held by the Eco-Systems Site Safety Officer to review and plan the specific health and safety aspects of scheduled work for the day.

6.0 LABORATORY CONSIDERATIONS

The laboratory director must be informed of any contaminant levels in the samples that would require special handling procedures to prevent risk to the health and safety of laboratory personnel.

7.0 PERSONAL PROTECTIVE EQUIPMENT

This section outlines the general usage guidelines for personal protective equipment.

7.1 HEAD PROTECTION

Hard hats must be worn by all personnel working onsite.

7.2 EYE PROTECTION

Safety glasses with side shields or goggles must be worn by all personnel performing activities where potential for eye or face exposure exists due to splash, dust, or vapor, etc. An eyewash station will be set up by the Site Safety Officer prior to commencing field activities and should be placed so that it could be used quickly in an emergency.

7.3 SKIN PROTECTION

Chemical resistant gloves and coveralls shall be worn by all personnel during subsurface and sample handling activities. These will be disposed of in a designated salable drum after each use or when they become worn or punctured.

7.4 FOOTWEAR

Chemically resistant boots with steel toes and shanks will be worn by field personnel engaged in the field activities at the site. Chemical resistant booties can be substituted for chemical resistant boots, although work boots to be covered must always maintain steel toes and shanks.

7.5 RESPIRATORY PROTECTION

For respiratory protection against possible volatile organics, half-face air purifying respirators (APR) will be required if Level D air monitoring action levels are exceeded. Specific cartridges to be utilized with the APRs will be combination organic vapor/dust/fume/mist/HEPA filter cartridges. All personnel must be properly fit-tested for the specific brand and size respirator to be used. A respirator which has not been successfully fit-tested cannot be used by an individual on the project. To ensure a proper fit, no facial hair will be allowed that will interfere with mask operation. The Site Safety Officer will determine if facial hair represents such an interference. Air purifying respirators will only be used if the following conditions are met:

- The oxygen content of the air is greater than 19.5 percent.
- Concentrations of air contaminants are known and monitored.
- The contaminants of concern all have good warning properties (i.e., odor threshold below PEL value).
- The protection factor is adequate and PELs are not exceeded.
- If concentrations of air contaminants exceed IDLH value, personnel must immediately evacuate.
- Cartridges are changed daily or whenever breakthrough occurs, whichever occurs first.

- Each person has been fit-tested for the specific brand and size of respirator used.
- The respirator is MSHA- and NIOSH-approved.

7.6 HEARING PROTECTION

Ear plugs or ear muffs shall be worn by all personnel in the vicinity of drilling operations to reduce their exposure to noise.

8.0 AIR QUALITY MONITORING

The primary goal of onsite air quality monitoring will be compliance with the specified contaminant action levels. The secondary goal will be documentation of personal exposures as required by OSHA 1910.120.

8.1 AIR QUALITY SURVEY

During field activities at the site, an air quality survey will be performed utilizing an HNu-photoionization detector (PID), OVA Flame ionizing detector (FID), or equivalent instrument to characterize volatile organic concentrations onsite. Standard operating procedures for these instruments must be followed.

8.2 PERSONNEL EXPOSURE MONITORING

The OSHA regulations for Hazardous Waste Workers (1910.120) states in Section (h) that, "Those closest to the source of contaminant generation shall receive personal air monitoring sufficient to characterize employee exposure."

Table 8-1
Air Monitoring Action Levvels for Level C and D Work

Contaminant	Instrument*	Reading	Action Taken
Volatile Organics	HNU, OVA	<2 ppm	Continue work in Modified Equivalent Level D
		>2 ppm	Upgrade to Level C and expand work zones
		> 5 ppm	Evacuate Area

* Sustained readings above background which shall not be exceeded within worker breathing zones or exclusion zones.

9.0 EMERGENCIES/ACCIDENTS

Illnesses, injuries and accidents occurring onsite must be attended to immediately in the following manner:

- Remove the injured or exposed persons(s) from immediate danger.
- Render first aid if necessary. Decontaminate affected personnel, if necessary.
- Call ambulance for transport to local hospital. This procedure should be followed event if there is no apparent serious injury. Emergency numbers are listed on the next page.
- Evacuate other personnel onsite to a safe place until the engineer (assisted by the Site Safety Officer) determines that it is safe for work to resume.
- Report the accident to the Health and Safety Officer immediately.
- Develop procedures, in accordance with the Health and Safety Officer, Site Safety Officer, and Engineer to prevent a recurrence.

In the event that an emergency sit evacuation should be necessary for any reason, the Site Safety Officer will render an alarm using a horn and all personnel shall leave the site. The assembly point will be designated in the field. Personnel will not return to the site until an all-clear has been received from the Site Safety Officer.

10.0 PERSONNEL ASSIGNMENTS

10.1 PROJECT PERSONNEL

Eco-Systems personnel authorized to work on this project and enter the site are:

Project Manager	Charles Coney
Site Safety Officer*	Charles Coney
Field Investigation/Site Manager	Charles Coney
Hydrogeologic Review	Charles Coney
Technician	Christopher Terrell
Drill Crew	Singley Environmental Services, Inc.

* To be completed prior to commencement of work.

10.2 PROJECT SAFETY PERSONNEL

Personnel responsible for implementing this safety plan are the Eco-Systems Project Manger and Site Safety Officer.

11.0 SAFETY PLAN APPROVALS

Project Name: Remedial Investigation
Project Number: HER24100

Project Manager — Date: 24 MAY 04

Health and Safety Officer — Date

12.0 SAFETY PLAN COMPLIANCE AGREEMENT

I, _____ (print name) have received a copy of the Safety Plan for the Remedial Investigation of the _____ Site in _____, (Eco-Systems Project No. _____). I have read the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the plan.

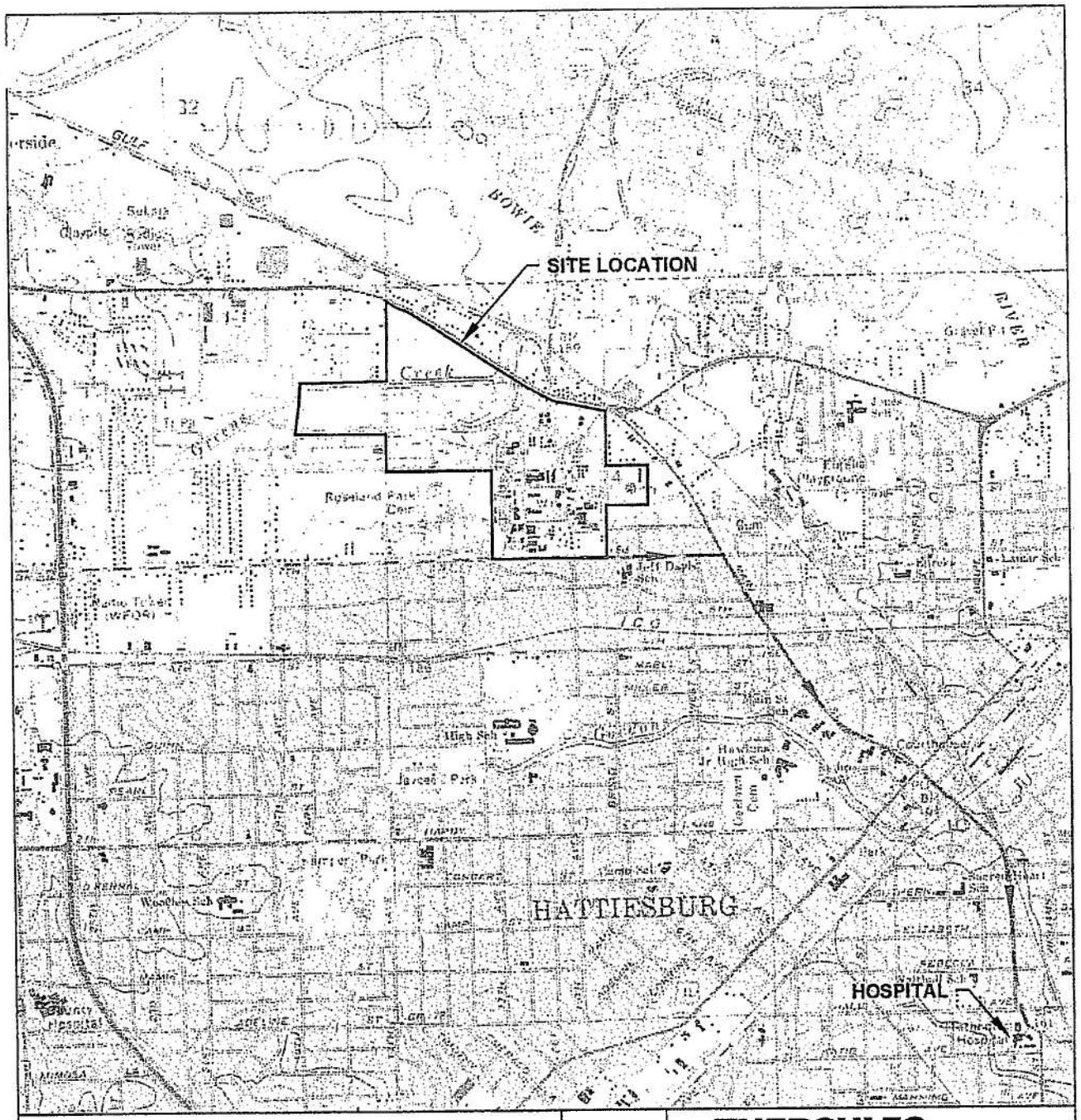
Signed:

_____

(Signature) (Date)

Firm: _____

FIGURES



QUADRANGLE LOCATION

SOURCE: DeLORME 3-D TopoQuads MAP – HATTIESBURG, MS

HERCULES

CHEMICAL SPECIALTIES

Eco-Systems, Inc.

Consultants, Engineers and Scientists

SCALE: 1"=2000'	DRAWN BY: N. SISSON	DATE: 05/24/04
	CHKD. BY: CJK	DATE: 24 MAY 04
PROJECT NO. HER24100	CAD FILE HER24100-ROUTE.dwg	
SITE LOCATION WITH DIRECTIONS TO HOSPITAL		FIGURE 1

APPENDIX A

HEAT STRESS CASUALTY PREVENTION PLAN

ESI

APPENDIX A

HEAT-STRESS CASUALTY PREVENTION PLAN

Due to the increase in ambient temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat-stress victim, the first aid treatment procedures for the victim and the prevention of heat stress casualties.

1 Identification and Treatment

1.1) Heat Exhaustion

1.1.1) Symptoms: Usually begins with muscular weakness, dizziness, nausea, and staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, his breathing is shallow. He may faint unless he lies down. This may pass, but sometimes it remains and death could occur

1.1.2) First Aid: Immediately remove the victim to the Personnel Decontamination Reduction Zone in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make him lie down, raise his feet 6 - 12 inches and keep him warm but loosen all clothing.) If the victim is conscious, it may be helpful to give him sips of a salt water solution (1 teaspoon of salt to 1 glass of water). Transport victim to a medical facility as soon as possible.

1.2) Heat Stroke

1.2.1) Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107o - 110oF. First there is often pain in the head, dizziness, nausea, oppression, and the skin is dry, red and hot. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly

1.2.2) First Aid: Immediately evacuate the victim to a cool and shady area in the Personnel Decontamination Reduction Zone. Remove all protective outer wear and all personal clothing. Lay him on his back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place him in a tub of cool water. The main objective is to cool him without chilling him. Give no stimulants. Transport the victim to a medical facility as soon as possible

2 Prevention of Heat Stress

2.1) One of the major causes of heat casualties is the depletion of body fluids. Plenty of fluids should be available on the site. Personnel should replace water and salts loss when perspiring. Salts can be replaced by either a 0 1 percent salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.

2.2) A work schedule should be established so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.

2.3) A work/rest guideline will be implemented for personnel required to wear Level C or higher level of protection. This guideline is as follows:

Ambient Temperatures	Maximum Wearing Time
Above 90°F	1/2 hour
80o - 90°F	1 hour
70o - 80°F	2 hours
60o - 70°F	3 hours

A sufficient period will be allowed for personnel to "cool down." This may require shifts of workers during operations.

3 Heat-Stress Monitoring

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or if slow recovery rates are indicated. When temperatures exceed 80 degree Fahrenheit, workers must be monitored for heat stress after every work period.

- Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The heart rate at the beginning of the rest period should not exceed 110 beats per minute. If the heart rate is higher, the next work period should be shortened by one third (33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by one third.

- Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature at the beginning of the rest period should not exceed 99.6 degree Fahrenheit. If it does, the next work period should be shortened by one third (33 percent), while the length of the rest period stays the same. However, if the oral temperature exceeds 99 6 degrees Fahrenheit at the beginning of the next period, the following work cycle should be further shortened by 33 percent. Oral temperature should be measured again at the end of the rest period to make sure that it has dropped below 99 degree Fahrenheit. Do not permit a worker to wear a semipermeable or impermeable garment if his/her oral temperature exceeds 100.6 degree Fahrenheit.

- Body water loss due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weigh-ins; preferably the worker should be nude. The scale should be accurate to plus or minus 1/4 pound. Body water loss should not exceed 1.5 percent of the total body weight. If it does, workers should be instructed to increase their daily intake of fluids by the weight loss

Ideally, body fluids should be maintained at a consistent level during the work day. This requires replacement of salt lost when perspiring.

Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

APPENDIX B

SAFETY GUIDELINES FOR DRILLINGS

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APPENDIX B

SAFETY GUIDELINES FOR DRILLING

Drill rig maintenance and safety is the responsibility of the drill rig operator. The following is provided as a general guideline for safe drilling practices on site.

B.1 Off-Road Movement of Drill Rigs

The following safety guidelines relate to off-road movement:

- Before moving a drill rig, first walk the route of travel, inspecting for depressions, slumps, gulleys, ruts and similar obstacles.
- Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven or hilly ground.
- Discharge all passengers before moving a drill rig on rough or hilly terrain.
- Engage the front axle (for 4 x 4, 6 x 6, etc., vehicles or carriers) when traveling off highway on hilly terrain
- Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill.
- Attempt to cross obstacles such as small logs and small erosion channel or ditches squarely, not at an angle.
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- After the drill rig has been moved to a new drilling site, set all brakes and/or locks When grades are steep, block the wheels.
- Never travel off-road with the mast of the drill rig in the raised or partially raised position.
- Tie down loads on the drill rig and support trucks during transport.

B.2 Overhead and Buried Utilities

The use of a drill rig near electrical power lines and other utilities requires that special precautions be taken by both supervisors and members of the exploration crew. Electricity can shock, burn and cause death. Overhead and buried utilities should be located, noted and emphasized on all boring location plans and boring assignment sheets. Before raising the drill rig mast on a site in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised and/or being raised. Do not raise the mast or operate the drill rig if this distance is less than 20-feet. Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind

B.3 Clearing the Work Area

Prior to drilling, adequate site cleaning and leveling should be performed to accommodate the drill rig and supplies and provide a safe working area Drilling should not commence when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions. In coordination with the drilling crew, the Site Safety Officer will review the precautions taken to ensure that the drill rig is leveled and stabilized.

B.4 Housekeeping On and Around the Drill Rig

The first requirement for safe field operations is that the drilling crew safety supervisor understand and fulfills the responsibility for maintenance and "housekeeping" on and around the drill rig. General housekeeping should include the following:

- Suitable storage-locations should be provided for all tools, materials and supplies so that they can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor.
- Avoid storing or transporting tools, materials or supplies within or on the mast of the drill rig.
- Pipe, drill rods, bits casing, augers and similar drilling tools should be orderly stacked on racks or sills to prevent spreading, rolling or sliding.
- Penetration or other driving hammers should be placed at a safe location on the ground or secured to prevent movement when not in use.
- Work areas, platforms, walkways, scaffolding and other accessways should be kept free of materials, obstructions and substances such as ice, excess grease or oil that could cause a surface to become slick or otherwise hazardous.
- Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease and/or ice
- Do not store gasoline in any portable container other than a non-sparking, red container with a flame arrester in the fill spout and having the work "gasoline" easily visible

B.5 Safe Use of Hand Tools

There are many hand tools which can be used on or around a drill rig. "Use the tool for its intended purpose" is the most important rule. The following are a few specific and some general suggestions which apply to safe use of several hand tools that are often used on and around drill rigs:

- When a tool becomes damaged, either repair it before using it again or get rid of it.
- When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others near you to wear safety glasses.
- When using a chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and stored when not in use
- Replace hook and heel jaws when they become visibly worn

- When loosening a string of drilling pipe on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform, should the wrench slip or the pipe joint suddenly release.

B.6 Safe Use of Wire Line Hoists, Wire Rope, and Hoisting Hardware

The use of wire line hoists, wire rope and hoisting hardware should be as stipulated by the American Iron and Steel Institute's Wire Rope Users Manual and should include the following precautions:

- All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper weaving, jamming, crushing, bird caging, kinking, core protrusion and damage to lifting hardware and any other feature that would lead to failure. Wire ropes should be replaced when inspection indicates excessive damage according to the wire rope users manual

- If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to assure that the swivel freely rotates under load.

- If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 foot (0.3m) of the drill rod column above the top of the mast, do not hoist a rod column with loose tool joints and do not make up, tighten or loosen tool joints while the rod column is being supported by a slipping device. If drill rods should slip back into the borehole, do not attempt to brake the fall of the rods with your hands.

- Most sheaves on drill rigs are stationary with a single part line. The number of parts of line should not ever be increased without first consulting with the manufacturer of the drill rig. Wire ropes must be properly matched with each sheave.

- The following procedures and precautions must be understood and implemented for safe use of wire ropes and rigging hardware.

- Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects away from the drill rig; however drills may be moved using the main hoist as the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.

- When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.

- When attempting to pull out a mired down vehicle or drill rig carrier, only use a winch on the front or rear of the vehicle or drill rig carrier and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to tow a mired vehicle or drill rig carrier.

- Minimize shock loading of a wire rope, apply loads smoothly and steadily.

- Protect wire rope from sharp corners or edges

- Replace faulty guides and rollers

- Replace worn sheaves or worn sheave bearings

- Replace damaged safety latches on safety hooks before using

- Know the safe working load of the equipment and tackle being used and never exceed this limit.
- Clutches and brakes of hoists should be periodically inspected and tested.
- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles and other lifting aids.
- Always wear gloves when handling wire ropes.
- Do not guide wire ropes on hoist drums with your hands.
- Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- Never carry out any hoisting operations when the weather conditions are such that hazards to personnel, the public or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep your hands away from hoists, wire rope, hoisting hooks, sheaves and pinch points as slack is being taken up and when the load is being hoisted.
- Never hoist the load over the head, body or feet of any personnel

B.7 Safe Use of Augers

The following general procedures should be used when advancing a boring with continuous flight or hollow-stem augers:

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM.
- The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must assure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.
- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatever.
- Never use your hands or feet to move cuttings away from the auger.

- Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating

B.8 Safety During Rotary and Core Drilling

Rotary drilling tools should be safety checked prior to drilling and should include the following:

- Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use
- Drill rod chuck jaws should be checked periodically and replaced when necessary.
- The capacities of hoists and sheaves should be checked against the anticipated weight of the drill rod string plus other expected hoisting loads. All cables should be inspected daily.

Special precautions should be taken for safe rotary or core drilling which involves chucking, joint break, hoisting and lowering of drill rods. These special precautions include:

- Drill rods should not be braked during lowering into the hold with drill rod chuck jaws
- Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved before breaking the first tool joint
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods
- If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough surface, fitted cover panels of adequate strength to hold drill rig personnel
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.
- All hydraulic lines should be periodically inspected for integrity and replaced as needed.

B.9 Start Up

All drill rig personnel and visitors should be instructed to "stand clear" of the drill rig immediately prior to and during starting of an engine. Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct nonactuating positions and the cathead rope is not on the cathead before starting a drill rig engine.

B.10 Safety During Drilling Operations

Safety requires the attention and cooperation of every worker and site visitor. The following considerations should be observed during drilling operations:

- Do not drive the drill rig from hole to hole with the mast in the raised position.

- Before raising the mast look up to check for overhead obstructions.
- Before raising the mast, all drill rig personnel and visitors (with exception of the operator) should be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors should be informed that the mast is being raised prior to raising it.
- Before the mast of a drill rig is raised and drilling is commenced, the drill rig must be first leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig should be releveled if it settles after initial set up. Lower the mast only when leveling jacks are down and do not raise the leveling jack pads until the mast is lowered completely.
- Before starting drilling operations, secure and/or lock the mast if required according to the drill manufacturer's recommendations.
- The operator of a drill rig should only operate a drill rig from the position of the controls. The operator should shut down the drill engine before leaving the vicinity of the drill.
- Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.
- Watch for slippery ground when mounting or dismounting from the platform.
- All unattended boreholes must be adequately covered or other wise protected to prevent drill rig personnel, site visitors or animals from stepping or falling into the hole. All open boreholes should be covered, protected or backfilled adequately and according to local or state regulations on completion of the drilling project.
- "Horsing around" within the vicinity of the drill rig and tool and supply storage areas should never be allowed, even when the drill rig is shut down.
- Be careful when lifting heavy objects.
- Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and unarched. In other words, perform the lifting with the muscles in your legs, not with the muscles in your lower back.
- Drilling operations should be terminated during an electrical storm.

APPENDIX C

MATERIAL SAFETY DATA SHEETS

International Chemical Safety Cards

DIOXATHION (ISOMER MIXTURE)

ICSC: 0883

DIOXATHION
S,S'-(1,4-Dioxane-2,3-diyl) O,O,O',O'-tetraethyl bis (phosphorodithioate
$C_{12}H_{26}O_6P_2S_4$
Molecular mass: 456.5

CAS # 78-34-2
RTECS # TE3350000
ICSC # 0883
UN # 3018
EC # 015-063-00-X

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Foam, powder, carbon dioxide,
EXPLOSION	The explosion hazard will depend on the solvent used in the formulation.		
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
• INHALATION	Convulsions. Dizziness. Laboured breathing. Nausea. Unconsciousness. Vomiting. Pupillary constriction, muscle cramp, excessive salivation.	Ventilation, local exhaust, or breathing protection	Fresh air, rest. Refer for medical attention
• SKIN	MAY BE ABSORBED! (Further see Inhalation)	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• EYES	Blurred vision.	Face shield, or eye protection in combination with breathing protection	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION	Abdominal cramps. Diarrhoea. Laboured breathing. Nausea. Unconsciousness. Vomiting. Pupillary constriction, muscle cramps, excessive salivation.	Do not eat, drink, or smoke during work.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!) Rest. Refer for medical attention

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from food and feedstuffs, strong oxidants, strong bases. Dry. Keep in a well-ventilated room	Do not transport with food and feedstuffs. T symbol R: 26/27/28 S: 1-13-28-45 UN Hazard Class: 6.1 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0883

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

DIOXATHION (ISOMER MIXTURE)

ICSC: 0883

I
M
P
O
R

PHYSICAL STATE; APPEARANCE: VISCOUS BROWN LIQUID

PHYSICAL DANGERS:

CHEMICAL DANGERS: The substance decomposes on heating and on burning producing toxic fumes including phosphorous oxides and sulfur oxides. Hydrolysed by alkalies. Not

ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol, through the skin, by ingestion.

INHALATION RISK: A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C on spraying

EFFECTS OF

R T A N T D A T A	stable on contact with iron and tin. OCCUPATIONAL EXPOSURE LIMITS (OELs): TLV: ppm; 0.2 mg/m³ (skin) (ACGIH 1991-1992)	SHORT-TERM EXPOSURE: The substance may cause effects on the nervous system . resulting in convulsions. respiratory failure Cholinesterase inhibitor Exposure at high level may result in death Medical observation is indicated EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Cholinesterase inhibitor; cumulative effect is possible: see acute hazards/symptoms.
PHYSICAL PROPERTIES	Melting point: -20°C Relative density (water = 1): 1.26 at 26°C	Solubility in water: None
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to crustaceas and fish.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of acute intoxication do not become manifest until 30 minutes to 2 hours Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home Delnav, Deltic and Hercules 528 are trade names.

Transport Emergency Card: TEC (R)-61 G44

ADDITIONAL INFORMATION

ICSC: 0883 DIOXATHION (ISOMER MIXTURE)

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IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

APPENDIX D

SITE SAFETY MEETING REPORT FORM

ESI

SITE SAFETY MEETING REPORT FORM

Project Number and Name: _____ Location: _____
Date and Time: _____ Activity: _____
Site Manager: _____ Site Health and Safety Officer: _____

EMERGENCY INFORMATION:

Hospital:	Location:	_____	Phone:	_____
Fire Department:	Location:	_____	Phone:	_____
Police	Location:	_____	Phone:	_____
Ambulance:	Location:	_____	Phone:	_____

ITEMS DISCUSSED:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

ATTENDEES:

Name (Printed)	Signature	Date

APPENDIX E

HEALTH AND SAFETY INCIDENT REPORT FORM

ECO·SYSTEMS, INC.

HEALTH AND SAFETY INCIDENT REPORT

Project Number_____ Date/Time of Incident_____

Project Name_____ Project Location_____

DESCRIPTION OF THE INCIDENT. Describe below, what happened and possible cause. Identify individuals involved, witnesses, and their affiliations Describe emergency and/or corrective action that was taken.

Name of Person Making Report:_____

Print Name Signature Date

NOTE: *This report must be sent to Eco·Systems HSO ASAP!*

Reviewed by:_____

Print Name Signature Date

Reviewed by:_____

Print Name Signature Date

Eco·Systems, Inc.

Distribution:

Eco·Systems Management_____

Project Manager_____

Site Manager_____

Site HSO_____

ECO·SYSTEMS, INC.

HEALTH AND SAFETY INCIDENT REPORT

Project Number_____ Date/Time of Incident_____

Project Name_____ Project Location_____

DESCRIPTION OF THE INCIDENT. Describe below, what happened and possible cause. Identify individuals involved, witnesses, and their affiliations Describe emergency and/or corrective action that was taken.

Name of Person Making Report:_____

Print Name Signature Date

NOTE: *This report must be sent to Eco·Systems HSO ASAP!*

Reviewed by:_____

Print Name Signature Date

Reviewed by:_____

Print Name Signature Date

Eco·Systems, Inc.

Distribution:

Eco·Systems Management_____

Project Manager_____

Site Manager_____

Site HSO_____

APPENDIX F

EMERGENCY SERVICES/PHONE NUMBERS AND ROUTE TO THE HOSPITAL

ESI

EMERGENCY SERVICES/PHONE NUMBERS AND ROUTE TO THE HOSPITAL

PROJECT: HERCULES, INC.
LOCATION: HATTIESBURG, MISSISSIPPI
PROJECT NO.: HER24100

The directions to the **hospital** are as follows:

1. From Hercules main gate on 7th Street, go left (eastward) approximately 1/8 mile to Main Street, and turn right.
2. Go approximatly 1.2 miles to the corner of Hall Ave. and Main Street.
3. Methodist Hospital is located on the southwest corner.

The list of emergency services must either be posted on-site or carried by all field personnel.

Emergency Service	Location	Telephone
Emergency Number	Hattiesburg, Mississippi	911
Fire Department	Hattiesburg, Mississippi	601/545-4691
Police Department	Hattiesburg Police Dept.	601/544-7900
Ambulance	Hattiesburg	601/
Hospital	Methodist Hospital	601/
Wesley Medical Center	Hattiesburg	601/268-8000
Poison Control Center	UMC - Jackson, Miss.	601/354-7660
Eco-Systems Physician	Rankin Medical Center Brandon, Mississippi	601/825-2811

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HERCULES

Corrective Action Plan
Hercules Incorporated
613 West 7th Street
Hattiesburg, Mississippi 39401

Prepared for:

Hercules Incorporated
1313 North Market Street
Wilmington, Delaware 19894

Prepared by:

Groundwater & Environmental Services, Inc.
5961 Live Oak Parkway, Suite B
Norcross, Georgia 30093

Jeffery S. Duncan, P.G.
Senior Project Manager

November 2004

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1.0 INTRODUCTION

On behalf of Hercules Incorporated (Hercules), Groundwater and Environmental Services, Inc. (GES) has prepared this Corrective Action Plan (CAP) for the Hercules facility located at 613 West 7th Street in Hattiesburg, Mississippi. A Site Location Map is included as **Figure 1**.

This CAP has been prepared in response to the Mississippi Department of Environmental Quality (MDEQ) request in a letter dated 12 August 2004. The 12 August 2004 MDEQ letter and subsequent GES response letter dated 28 September 2004 provided further clarification on the 16 July 2004 Remedial Action Evaluation (RAE) and the implications on the preparation of this CAP. GES has incorporated the intent of these communications in this CAP.

1.1 BACKGROUND

As presented in the referenced RAE prepared by Eco-Systems, Inc. (Eco-Systems), the following provides a background summary of site investigations conducted at the facility.

Site investigations at the Hercules facility in Hattiesburg Mississippi, which were conducted between April 1999 and November 2003, are discussed in the *Interim Groundwater Monitoring Report* (Eco-Systems, January 2003), the *Hercules Site Investigation Report* (Eco-Systems, April 2003), and the *Supplemental Site Investigation Report* (Eco-Systems, November 2004). The findings of the site investigations include the following:

- Detection of volatile organic compounds (VOCs) in groundwater at concentrations above Target Remediation Goals (TRGs) in the Landfill and Groundwater areas of the site;
- Delineation of the lateral limits of the Landfill based on geophysical investigation;
- Presence of VOCs and Dioxathion at concentrations less than TRGs in surface water and sediment samples collected from Green's Creek, and;
- Presence of VOCs and Dioxathion in one of three groundwater monitoring wells located hydraulically downgradient of the sludge pits. It should be noted that Dioxathion has not been detected above the TRGs in this area.

Site investigations indicated that neither VOCs nor Dioxathion, are migrating via groundwater or surface water onto off-site properties. Some of the VOCs detected in Green's Creek were detected in samples collected from the location

where Green's Creek enters the property, which indicates that, at least, some of the VOCs are due to upstream, off-site, sources.

1.2 FACILITY SETTING AND OVERVIEW

As presented in the RAE prepared by Eco-Systems, the following presents the facility settings and overview.

The Hercules facility is located on approximately 200 acres of land north of West Seventh Street in Hattiesburg, Forest County, Mississippi. More specifically, the Site is located in Sections 4 and 5, Township 4 North, Range 13 West, just north of Hattiesburg, Mississippi **(Figure 1).** The facility has been in operation since 1923. The facility is bordered to the north by Highway 42 and beyond which is Illinois-Central & Gulf Railroad, along with various residential and commercial properties. The southern property boundary is bordered by 7th Avenue; and by Roseland Park cemetery and Zeon Chemical Corporation to the south-southwest. Across from these locations are residential areas. The eastern and western boundaries are bordered by sparsely populated residential and commercial areas.

The facility's historical operations consisted of wood grinding, shredding, extraction, fractionation, refining, distillation, and processing of rosin from pine tree stumps. Historically, over 250 products were produced from the above-referenced operations and included: modified resins, polyamides, ketene dimmer, crude tall oil wax emulsions, and Delnav, an agricultural miticide. Structures at the facility include offices, a laboratory, a powerhouse, production buildings, a wastewater treatment plant, settling ponds, a landfill, and central loading and packaging areas.

Previous investigations at the Hercules facility have centered on efforts to determine whether the miticide, Dioxathion, was present in site soil and groundwater. The work has included soil, groundwater, surface water, and stream sediment sampling and analysis. The work has also included geophysical investigation to delineate the limits of the landfill and to investigate the potential for buried metal in a location identified by the MDEQ. The results of previous investigations are discussed in reports, which have been submitted to the MDEQ:

1. *Site Inspection Report*, B&V Waste Science and Technology Corp., April, 1993.
2. *Work Plan for Well Installation*, Bonner Analytical Testing Company; June, 1997.
3. *Installation, Sampling, and Analysis Report*, Bonner Analytical Testing Company; December, 1997.

4. *Quarterly Monitor Well Sampling Event Reports*, Bonner Analytical Testing Company; June, 1998 through October, 1998.
5. *Site Investigation Work Plan*, Eco-Systems, Inc., February 1999.
6. *Interim Groundwater Monitoring Report*, Eco-Systems, Inc. January 2003.
7. *Site Investigation Report*, Eco-Systems, Inc. April 2003.
8. *Work Plan for Supplemental Site Investigation*, Eco-Systems, Inc. June 2003.
9. *Supplemental Site Investigation Report*, Eco-Systems, Inc. November 2003.
10. *Remedial Action Evaluation,* Eco-Systems, Inc. July 2004.

The information discussed in the listed documents indicates that sources, source area concentrations, and vertical and horizontal extent of groundwater containing constituents of concern have been defined sufficiently for corrective action planning purposes. The existing data does not indicate that the site poses a significant threat to human health and the environment in its current use as a chemical production facility. However, if changes in land use occur or additional information is obtained, the current risk scenario for the site could also change.

1.3 PURPOSE AND SCOPE

The purpose of this CAP is to present the regarding the reflected remedial option for each of the four areas of the site included in the RAE. The scope of this CAP is presented in the following sections:

- Section 2.0 presents the completed design per area;
- Section 3.0 presents the components per area;
- Section 4.0 presents the schedule for each component;
- Section 5.0 presents the Remedial Goals;
- Section 6.0 presents the Operation & Monitoring Plan for the fencing;
- Section 7.0 presents the Performance Monitoring Plan for MNA;
- Section 8.0 presents the Compliance Monitoring Plan for each area;
- Section 9.0 presents the Contingency Plan for each area;
- Section 10.0 presents Quality Assurance Project Plan considerations per area, and;
- Section 11.0 presents Health and Safety Plan considerations.

2.0 CONCEPTUAL DESIGN

The conceptual design of this CAP is comprised of Monitored Natural Attenuation (MNA) and institutional controls consisting of fencing and deed restrictions. The specific conceptual design of each of the areas is included below.

2.1 SLUDGE PITS

For the sludge pits, this CAP presents MNA combined with a deed restriction to restrict future land use of the sludge pits and nearby surrounding areas and the maintenance of the existing chain-link fence surrounding the facility to limit current and future exposure to the Sludge Pits..

2.2 LANDFILL

For the landfill, this CAP presents MNA combined with a deed restriction to restrict future land use in the landfill area.

2.3 GROUNDWATER

For Groundwater, this CAP presents MNA combined with deed restrictions to restrict future land use in the area of groundwater containing VOCs in excess of the TRGs.

2.4 GREEN'S CREEK

For Green's Creek, this CAP presents MNA combined with a deed restriction to restrict future land use of Green's Creek and the maintenance of the existing chain link fence surrounding the facility to limit current and future exposure to Green's Creek.

3.0 SYSTEM COMPONENTS

The primary components of this CAP consist of groundwater and surface water monitoring networks, deed restrictions and fencing. All work will be completed in accordance with the Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM) dated November 2001. The locations of groundwater and surface water monitoring locations are presented on **Figure 2**. The analytical requirements by area are presented on **Table 1**. The specific components of each area are described below.

3.1 SLUDGE PITS

The components of this CAP for the Sludge Pits consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use;
- Maintenance of an existing chain-link fence around the facility and;
- Collection of groundwater samples from an existing monitoring well network consisting of MW-2, MW-3, MW-4, MW-10 and MW-11. The samples will be analyzed for VOCs via USEPA SW846-8260 and Dioxathion (cis- and trans-) and Dioxenethion via the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.

3.2 LANDFILL

The system components of this CAP for the Landfill consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use, and;
- Collection and analysis of groundwater samples from a monitoring well network consisting of existing wells MW-5 and MW-6 and proposed wells MW-12, MW-13 and MW-14. The samples will be analyzed for VOCs via USEPA SW846-8260.
- Proposed monitoring wells MW-12, MW-13 and MW-14 will be installed as permanent two-inch diameter wells as follows:

- Soil borings will be installed via; Hollow Stem Auger (HSA) drilling rig;

- Permanent wells will be installed in the soil borings to bracket the observed water table with a 10-foot screened interval; which will be constructed to monitor the same water-bearing zone as monitoring wells MW-5 and MW-6.

- The estimated total depths of these monitoring wells is 20-feet below ground surface.

3.3 GROUNDWATER

The components of this CAP for Groundwater consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future residential land use, and;

- Collection of groundwater samples from a monitoring well network consisting of existing monitoring wells MW-7, MW-8 and MW-9, proposed monitoring wells MW-15, MW-16 and MW-17 and proposed compliance wells MW-18 and MW-19. It should be noted that an additional well is proposed, for a total of three proposed new wells, so that permanent wells are installed at both locations of water samples collected from GP-2 and GP-4. The samples will be analyzed for VOCs via USEPA SW846-8260 and the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.

- Proposed monitoring wells MW-15 through MW-19 will be installed as permanent two-inch diameter wells as follows:

  - Soil borings will be installed via; Hollow Stem Auger (HSA) drilling rig;

  - Permanent wells will be installed in the soil borings to bracket the observed water table with a 10-foot screen interval; which will be constructed to monitor the same water-bearing zone as monitoring wells MW-7, MW-8 and MW-9.

  - The estimated total depths of those monitoring wells is 20-feet below ground surface.

3.4 GREEN'S CREEK

The components of this CAP for Green's Creek consist of the following:

- Deed amendment to restrict land use to commercial/industrial and eliminate potential future land use;
- Maintenance of an existing chain-link fence around the facility, and;
- Collection and analysis of surface water samples from a surface water monitoring network consisting of CM-00 through CM-05. The samples will be analyzed for VOCs via USEPA SW846-8260 and .the Dioxathion Sampling and Analysis Protocol (Appendix A). This method is a combination of USEPA SW846-3510/8321 using HPLC-PDA analyses.

4.0 SCHEDULE

The CAP presented herein will be initiated upon approval by MDEQ. A groundwater monitoring schedule is presented as **Table 2**. An implementation schedule and duration of implementation for each component is described below.

4.1 DEED RESTRICTIONS

Deed restrictions for each of the four areas will be initiated within 30-days following MDEQ's approval of this CAP. It is currently envisioned that the necessary documentation of the deed restrictions will be provided in the first annual CAP Implementation Report.

4.2 GROUNDWATER AND SURFACE WATER MONITORING

Implementation of groundwater and surface water monitoring well be implemented within 90-days following MDEQ's approval of this CAP. The monitoring will be completed on a quarterly basis for the period of two years. At the conclusion of eight (8) quarterly monitoring events, an evaluation of the need for further monitoring and a schedule for such monitoring will be proposed to MDEQ at that time.

5.0 *REMEDIAL GOALS*

The overall remedial goals (RGs) of this CAP are to restrict future land use via deed restrictions, limit current and future potential exposure via fencing and document long-term natural attenuation of groundwater constituents via MNA. The following presents the rationale for determining when the remedial goals have been achieved.

The RG of restricting future land use will be considered complete once the deed restrictions are complete and the supporting documentation has been provided to MDEQ.

The RG of limiting current potential exposure considered complete since existing fencing is protective of exposure to the Sludge Pits and Green's Creek. For the RG of limiting potential future exposure an inspection and maintenance will be implemented to ensure the integrity of the fencing.

The RG of documenting long-term natural attenuation of groundwater constituents will be considered complete once a sufficient amount of MNA data has been compiled and evaluated to support the that groundwater constituents are decreasing over time and the extent of the groundwater plume(s) are reducing in areal extent over time.

6.0 *OPERATION AND MONITORING PLAN*

The only component of this CAP that requires an Operation and Monitoring (O&M) requirement is inspection of fencing. Annual inspection and maintenance will be implemented to limit future potential exposure to these areas. Documentation of the annual inspection and maintenance will be included in Annual Monitoring Reports. Barring any unforeseen circumstances, any necessary repairs to the fencing will be completed within 90-days following any observance.

7.0 *PERFORMANCE MONITORING PLAN*

The CAP component that requires a Performance Monitoring Plan is MNA. MNA will be evaluated based on groundwater constituent concentrations and areal distribution of groundwater plume(s) over time.

Implementation of this Performance Monitoring Plan will be documented in Annual Monitoring Reports that will be submitted to MDEQ. Each annual report will document the quarterly activities conducted during that year and will provide all data generated to date. The reports will contain copies of the analytical reports, chain-of-custody forms, and a discussion of the data evaluation. Liquid-level data collected during groundwater sampling will be used to determine groundwater elevations and flow direction. The groundwater analytical data will be tabulated and screened against the MDEQ TRGs. Groundwater potentiometric and quality maps will be prepared for the main constituents detected in excess of their respective TRGs to facilitate an evaluation of groundwater plume areal extent over time. Groundwater constituent trend charts will be prepared to facilitate an evaluation of groundwater constituent concentrations over time.

8.0 COMPLIANCE MONITORING PLAN

During the implementation of this CAP, compliance monitoring for the MNA component will be conducted in each of these areas. The compliance monitoring is required to ensure that contingent actions are undertaken if certain "triggers" are met. These "triggers" are identified as either: (1) a significant increase in either downgradient groundwater constituents, or; (2) a significant increase in the extent of groundwater plume(s).

8.1 SLUDGE PITS

Compliance monitoring in the Sludge Pits area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-4, MW-10 and MW-11. The data generated from these monitoring wells will provide an evaluation of groundwater quality emanating from the Sludge Pits area and towards Green's Creek.

8.2 LANDFILL

Compliance monitoring in the landfill area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-5, MW-12 and MW-14. The data generated from these monitoring wells will provide an evaluation of groundwater quality emanating from the landfill area and towards Green's Creek.

8.3 GROUNDWATER

Compliance monitoring in the Groundwater area will consist of evaluating the analytical data generated from downgradient monitoring wells MW-14 (landfill well) and MW-15. The data generated from these wells will provide an evaluation of groundwater quality emanating from the Groundwater area and towards Green's Creek.

8.4 GREEN'S CREEK

Compliance monitoring for Green's Creek will consist of evaluating the analytical data in downgradient surface water sampling locations CM-03, CM-04 and CM-05. The data generated from those surface water monitoring locations will

provide an evaluation of surface water in the creek on-site and quality of surface water leaving the property. The data from these points will be compared to the upgradient monitoring points CM-00, CM-01 and CM-02.

9.0 CONTINGENCY PLAN

The following Contingency Plan has been prepared and will be enacted should the specific "triggers" identified in Section 8.0 be met. The overall contingency plan approach is that if MDEQ or Hercules suspects that a 'trigger' condition has been met, a meeting will be held between both parties (and/or representatives) to facilitate an objective evaluation of the situation including; the data, the potentential risk to human health and the environment, current technologies, prior to initiation of any of the specificed contingency actions identified below. A specific plan for each area is described below.

9.1 SLUDGE PITS

Contingent measures will be necessary if it is determined that a sustained significant increase in constituents is present in monitoring wells MW-4, MW-10 and MW-11 above TRGs. A sustained significant increase in constituent concentrations in these wells would indicate that a release of constituents from the Sludge Pits area may have occurred. If deemed necessary, the contingent plan for the Sludge Pits area consists of installation of the cap as detailed in the RAE.

Upon approval of this CAP, Hercules will purchase financial assurance in the amount of $758K to cover the costs of installing a cap on the Sludge Pits should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

9.2 LANDFILL

Groundwater quality in the landfill area does not exhibit constituents above the TRGs and does not pose a potential groundwater exposure risk that would require a contingency plan.

9.3 GROUNDWATER

Contingent measures will be necessary if it is determined that a sustained significant increase in constituents is present in monitoring wells MW-5, MW-12 and MW-14 above TRGs. A sustained significant increase in constituent concentrations in these wells would indicate that a significant source of groundwater constituents is present in the Groundwater area. If deemed

necessary, the contingent plan for the Groundwater consists of *in-situ* chemical oxidation (ISCO) as detailed in the RAE.

Upon approval of this CAP, Hercules will purchase financial assurance in the amount of $669K to cover the costs of implementing ISCO in the Groundwater area should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

9.4 GREEN'S CREEK

Contingent measures will be necessary if it is determined that a sustained significant increase in constituents is present in downgradient surface water monitoring points CM-03, CM-04 and CM-05 as compared to the constituents observed in upgradient surface water points CM-00, CM-01 and CM-2. A sustained significant increase in constituent concentrations in the downgradient surface water monitoring points would indicate that a release of constituents from the Sludge Pits area may have occurred. If deemed necessary, the contingent plan for Green's Creek will consist of addressing the Sludge Pits area as detailed in Section 9.1.

As previously discussed, upon approval of this CAP, Hercules will purchase financial assurance in the amount of $758K to cover the costs of installing a cap on the Sludge Pits should the contingent measure become necessary. The financial assurance will name MDEQ as a beneficiary should Hercules become unable to cover the potential financial responsibility of this measure.

10.0 *QUALITY ASSURANCE PROJECT PLAN*

The following Quality Assurance Project Plan (QAPP) considerations have been prepared for the MNA component of this CAP. Specifically, these considerations have been made to assure the quality of the analytical data to be generated is sufficient to be used to evaluate groundwater quality trends and ensure that implementation of the CAP is protective of human health and the environment. All work will be completed in accordance with the Quality Provisions of SW846 QA/QC Protocol and EPA Region IV EISOPQA dated November 2001.

The following field sampling QAPP considerations will be followed:

- Blind Field Duplicate samples will be collected at the rate of 1 per 20 samples;
- Equipment field rinsate samples will be collected at the rate of 1 per field day per non-disposable equipment used;
- Trip blank samples will be analyzed at the rate of 1 per cooler containing samples for VOC analysis.

The results of these samples will be tabulated and included in the Annual Monitoring Reports.

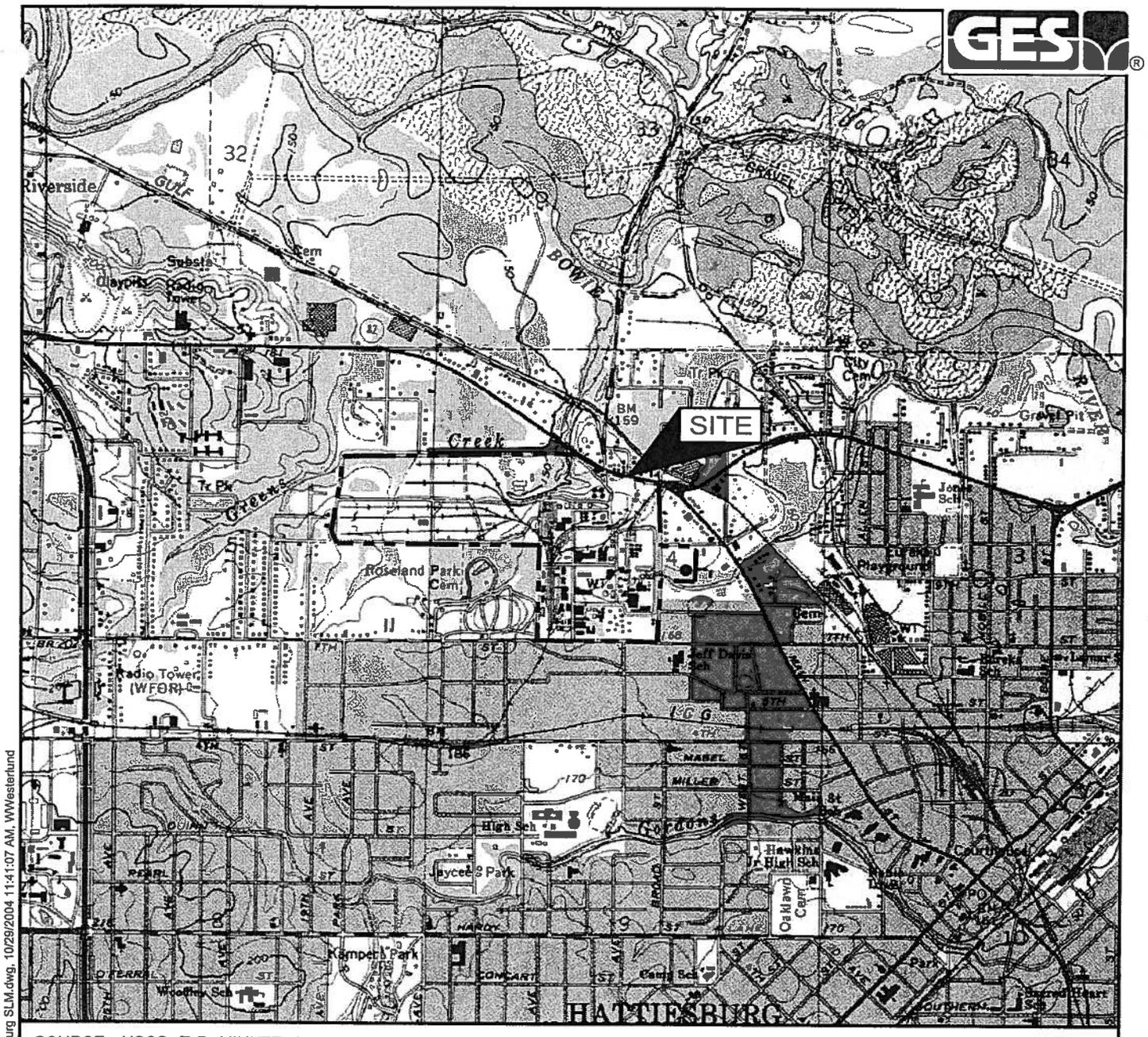
The Data Quality Objectives (DQOs) for the groundwater data generated during implementation of this CAP will be the TRGs. The groundwater analytical parameter list is provided as **Table 3**. This table also presents the TRGs and the respective laboratory analytical reporting limits. For those compounds where the screening criteria are lower than the report limit (RL), the method detection limit (MDL) will be used. If detections are made between the RL and the MDL, the resulting detection will be j-flagged indicating that the detection is estimated. It should be noted, that this table also presents (in bold) the compounds with MDLs that exceed the TRGs.

11.0 HEALTH AND SAFETY PLAN

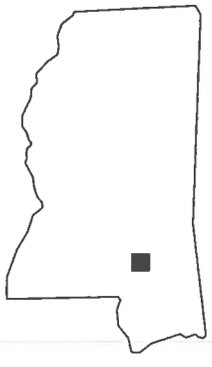
A Health & Safety Plan (HASP), consistent with the requirements of OSHA 1910.120 Hazardous Waste Operations (Hazwoper), will be prepared prior to the conduct of any and all on-site field operations. In addition, all field personnel and subcontractors will be required to attend a Hercules Incorporated site-specific health and safety training meeting prior to commencement of field activities.

Figures

Figures



SOURCE: USGS 7.5 MINUTE SERIES
TOPOGRAPHIC QUADRANGLE 1982
HATTIESBURG, MISSISSIPPI
CONTOUR INTERVAL = 10'



QUADRANGLE LOCATION

LAT. 031° 20' 24.78" N
LONG. 089° 18' 28.22" W
(APPROXIMATE SITE COORDINATES)

DRAFTED BY: W.A.W. (N.J.)	SITE LOCATION MAP
CHECKED BY:	HERCULES INCORPORATED 613 WEST 7th STREET HATTIESBURG, MISSISSIPPI
NORTH	Groundwater & Environmental Services, Inc. 5961 LIVE OAK PKWY, SUITE B, NORCROSS, GEORGIA 30093

SCALE IN FEET	DATE	FIGURE
0 — 2000	10-29-04	1

hics\2300-Atlanta\MISC\Hercules\Hattiesburg\hattiesburg SLM.dwg, 10/29/2004 11:41:07 AM, WWesterlund

Tables

Tables

Table 1
Analytical Requirements by Area
Hercules Incorporated Facility
Hattiesburg, Mississppi

Area	Analytical Requirements	Analytical Method
Sludge Pits	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans-), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis
Landfill	(1) Appendix IX Volatile Organic Compounds	(1) SW846-8260
Groundwater	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis
Green's Creek	(1) Appendix IX Volatile Organic Compounds (2) Dioxathion (cis- and trans-), Dioxenethion	(1) SW846-8260 (2) SW846-3510/8321, HPLC analysis

Table 2
Groundwater Monitoring Schedule
Hercules Incorporated Facility
Hattiesburg, Mississippi

Monitoring Location	Sample Classification	Initial Monitoring Schedule
Liquid Levels		
Piezometers		
TP-3	Groundwater Elevation	Quarterly
TP-4	Groundwater Elevation	Quarterly
TP-5	Groundwater Elevation	Quarterly
TP-6	Groundwater Elevation	Quarterly
TP-7	Groundwater Elevation	Quarterly
TP-11	Groundwater Elevation	Quarterly
Monitoring Wells		
MW-2	Groundwater Elevation	Quarterly
MW-3	Groundwater Elevation	Quarterly
MW-4	Groundwater Elevation	Quarterly
MW-5	Groundwater Elevation	Quarterly
MW-6	Groundwater Elevation	Quarterly
MW-7	Groundwater Elevation	Quarterly
MW-8	Groundwater Elevation	Quarterly
MW-9	Groundwater Elevation	Quarterly
MW-10	Groundwater Elevation	Quarterly
MW-11	Groundwater Elevation	Quarterly
MW-12	Groundwater Elevation	Quarterly
MW-13	Groundwater Elevation	Quarterly
MW-14	Groundwater Elevation	Quarterly
MW-15	Groundwater Elevation	Quarterly
MW-16	Groundwater Elevation	Quarterly
MW-17	Groundwater Elevation	Quarterly
MW-18	Groundwater Elevation	Quarterly
MW-19	Groundwater Elevation	Quarterly
Green's Creek Staff Gauges		
SG-1	Groundwater Elevation	Quarterly
SG-2	Groundwater Elevation	Quarterly
SG-3	Groundwater Elevation	Quarterly
SG-4	Groundwater Elevation	Quarterly

Table 2
Groundwater Monitoring Schedule
Hercules Incorporated Facility
Hattiesburg, Mississippi

Monitoring Location	Sample Classification	Initial Monitoring Schedule
Groundwater Sampling		
Sludge Pits		
MW-2	Upgradient Well	Quarterly
MW-3	Upgradient Well	Quarterly
MW-4	Downgradient Well	Quarterly
MW-10	Downgradient Well	Quarterly
MW-11	Downgradient Well	Quarterly
Landfill		
MW-5	Downgradient Well	Quarterly
MW-6	Upgradient Well	Quarterly
MW-12 *P*	Upgradient Well	Quarterly
MW-13 *P*	Upgradient Well	Quarterly
MW-14 *P*	Downgradient Well	Quarterly
Groundwater		
MW-7	Upgradient Well	Quarterly
MW-8	Downgradient Well	Quarterly
MW-9	Upgradient Well	Quarterly
MW-15 *P*	Downgradient Well	Quarterly
MW-16 *P*	Downgradient Well	Quarterly
MW-17 *P*		
MW-18 *P*	Point of Compliance Well	Quarterly
MW-19 *P*	Point of Compliance Well	Quarterly
Green's Creek		
CM-00	Upgradient Surface Water	Quarterly
CM-01	Upgradient Surface Water	Quarterly
CM-02	Upgradient Surface Water	Quarterly
CM-03	Downgradient Surface Water	Quarterly
CM-04	Downgradient Surface Water	Quarterly
CM-05	Downgradient Surface Water	Quarterly

Notes:
~ No Analytical Data Available
P - Proposed Monitoring Well
Initial Monitoring Schedule proposed for the first 2 years of CAP implementation

Table 3
Screening Criteria and
Reporting Limits
Hercules Incorporated Facility
Hattiesburg, Mississippi

Sample ID	MDEQ TRGs	Reporting Limit[1]
Appendix IX Volatile Organic Compounds (VOCs) *Method SW8260B* (ug/L)		
Acetone	608	25
Acetonitrile	125	40
Acrolein (Propenal)	**0.0416**	**10**
Acrylonitrile	**0.0367**	**5.7**
Benzene	5	1.0
Bromodichloromethane	0.168	0.14
Bromoform	8.48	1.0
Bromomethane (Methyl bromide)	8.52	1.0
2-Butanone (Methyl ethyl ketone)	1,910	10
Carbon disulfide	1,040	1.0
Carbon tetrachloride	5	1.0
Chlorobenzene	100	1.0
Chloroethane	3.64	1.0
Chloroform	0.155	0.37
Chloromethane (Methyl Chloride)	1.43	1.0
Chloroprene (1,3 Butadiene)	**0.00696**	**1.0**
3-Chloroprene (Allylchloride)	1.43	1.0
Dibromochloromethane	**0.126**	**0.5**
1,2-Dibromo-3-chloropropane	**0.2**	**0.47**
1,2-Dibromoethane (EDB)	**0.0500**	**0.39**
Dibromomethane (Methylene bromide)	60.8	1.0
trans-1,4-Dichloro-2-butene	**0.00135**	**0.78**
Dichlorodifluoromethane	348	1.0
1,1 Dichloroethane	798	1.0
1,2 Dichloroethane	5	1.0
1,1 Dichloroethene	7	1.0
cis-1,2 Dichloroethene	70	1.0
trans-1,2 Dichloroethene	100	1.0
1,2 Dichloropropane	5	1.0
cis-1,3-Dichloropropene	0.0842	1.0
trans-1,3-Dichloropropene	0.0842	1.0
Ethylbenzene	700	1.0
Ethyl methacrylate	548	1.0
2-Hexanone	1,460	10
Iodomethane (Methyl iodide)	~	1.0
Isobutanol (Isobutyl alcohol)	~	40
Methacrylonitrile	**1.04**	**20**
Methylene chloride (Dichloromethane)	5	5
Methyl methacrylate	1,420	1.0
4-Methyl-2-pentanone	139	10
Pentachloroethane	~	5
Propionitrile	~	20
Styrene	100	1.0
1,1,1,2-Tetrachlorethane	0.406	0.26
1,1,2,2-Tetrachlorethane	**0.0527**	**0.18**
Tetrachloroethene	5	1.0
Toluene	1,000	1.0
1,1,1-Trichloroethane	200	1.0
1,1,2-Trichloroethane	5	1.0
Trichloroethene	5	1.0
Trichlorofluoromethane	1,290	1.0
1,2,3-Trichloropropane	**0.00623**	**0.61**
Vinyl acetate	412	2.0
Vinyl chloride	2	1.0
Xylenes, total	10,000	2.0
Additional Parameters *Method SW846 3510C* (ug/L)		
Dioxenethion	~	0.400
Dioxathion (cis)	54.8	0.400
Dioxathion (trans)	54.8	0.400

Notes:
~ = not available or not applicable
Screening Criteria = MDEQ, Final Regulations Governing Brownsfield Voluntary Cleanup and Redevelopment in Mississippi (amended 28 Feb 2002), Appendix A, Tier 1 Target Remedial Goal
[1] For compounds where Reporting Limit > Screening Criteria, the Method Detection Limit is used
bold = method detection limit exceeds screening criteria

Appendix A

Appendix A

Dioxathion Sampling and Analysis Protocol

SAMPLING AND ANALYSIS PROTOCOL FOR THE DETERMINATION OF DIOXATHION IN WATER

Recent results of analyses of well water samples from the Hercules Incorporated plant in Hattiesburg, Mississippi, have exhibited a wide range in the levels of dioxathion reported. Discussions among representatives from the analytical laboratories demonstrated that the samples analyzed to date were not true split samples and that the analytical methods were applied differently. In order to minimize the effects from different water samples and from inconsistent application of the analytical methods, the following protocol has been assembled by agreement between Hercules Incorporated and the Mississippi State Chemical Laboratory. This protocol will be used in a study to determine the proper sampling and analysis methods to be used for all future water monitoring programs at the Hattiesburg plant.

1.) SAMPLE COLLECTION

Water samples will be withdrawn from the well using a Teflon bailer. The contents of the bailer will be placed into a large glass or Teflon container (one gallon, or more, in size). The container should have a Teflon-lined screw cap. Successive bailers of water will be removed from the well and placed into the container until there is enough water to supply split samples to each laboratory participating in the study. The contents of the large container will then be mixed thoroughly. After the composited water sample in the large container has been mixed, equal amounts of water will be poured into each sample jar. The sample jars should have Teflon-lined screw caps. This procedure will be repeated for each well.

Each analytical batch of a given matrix (up to 20 samples) will require the analysis of a method blank, Laboratory Control Standard (LCS), Matrix Spiked sample (MS) and Matrix Spike Duplicate (MSD). Alternately , a duplicated sample may be substituted for the (MSD). The MS and the MSD are counted as part of the analytical batch (aka Sample Delivery Group) which may be held open for up to seven (7) days.

Water samples collected from Wells #1, #4 and #5 will be submitted in duplicate to each laboratory. That is, two separate sample jars from Well #1, Well #4 and Well #5 will be filled and sent to each laboratory for analysis.

NOTE: The sample collected for the MS/MSD will require six (6) one-liter samples.

2.) EXTRACTION OF SAMPLES

All samples will be extracted with methylene chloride following the details described in the latest revision of U.S. EPA SW-846 Method 3510 C. The solvent should be exchanged into hexane, and all extracts will be adjusted to a final volume of ten milliliters (10 mL) before analysis.

3.) CLEANUP OF EXTRACTS

In order to minimize interferences in the determination of dioxathion, sample extracts that appear to contain interferences will be cleaned up using the latest revision of U.S. EPA SW-846 Method 3620, Florisil Cleanup. The volume of eluting solvent necessary for quantitative recovery of dioxathion from the Florisil column will be determined in each laboratory using the dioxathion and dioxenethiol reference standards supplied for calibration of the GC methods.

4.) SULFUR CLEANUP

If there is significant interference from sulfur compounds, the extracts may be cleaned up according to U.S. EPA SW-846 Method 3660, copper option.

5.) ANALYSIS OF EXTRACTS

Previous work performed by Bonner Analytical and Testing (BATCO) has revealed that trans dioxathion undergoes thermal degradation in the Gas Chromatograph column therefore the protocol is changed to a lower temperature analytical method. For All sample extracts will be analyzed by High Performance Liquid Chromatography (HPLC)) using a Photo Diode Array (PDA), operated in . U.S. EPA SW-846 Method 8321 A will be used as general guidance for HPLC methodology. . A five-point calibration curve will be used to calculate the results of analyses. The lowest point on the calibration curve should be equal to, or slightly higher than, the limit of detection of the GC-PDA system. The highest point on the calibration curve should be the end of the linear portion of the PDA response profile. All laboratories will follow the QA/QC criteria described in the analytical method. Those results will be stored at each laboratory for review at a later date, if necessary.

Instrumentation

HPLC – Hewlett Packard Model 10980 Series II Liquid Chromatograph with Diode Array Detector
Fluoresence Detector Hewlett Packard Series 1100 HPLC Column:
Supelco Discovery C18, 250 mm X 4.6 mm ID, 5 µm Particle Size.

Method Parameters

Mobile Phase : Isocratic, 30% Deionized water and 70 % Acetone
Flow: 1.2 mls/min
Injection Volume: 25 µLs
Run Time: 20 Minutes
Oven Temperature 35 °C
Detector Wavelengths
Diode Array: Excitation at 200, 210 and 270 nms
Fluorescence: Excitation at 250 nms, Emission at 410 nms

Surrogate/Internal Standards: A surrogate will be chosen that does not coelute with any dioxathion isomer. Internal standards may or may not be used.

6.) CONFIRMATION OF ANALYSES

The preferred method for qualitative and quantitative confirmation of dioxathion and dioxenethiol is Liquid Chromatography/Mass Spectra analysis (LC/MS), however the present time Bonner Analytical and Testing does not own an LC/MS instrument. Therefore, for qualitative and quantitative confirmation of the dioxathion results, all sample extracts will be analyzed by Bonner Analytical and Testing using gas chromatography-mass spectrometry (GC-MS) using the latest revision of U.S. EPA SW-846 Method 8270, or an equivalent mass spectrometry system that is deemed appropriate to give equivalent results. A five-point calibration curve will be used to calculate the results of analyses. The lowest point on the calibration curve should be equal to, or slightly higher than, the limit of detection of the GC-MS system. The highest point on the calibration curve should be the end of the linear portion of the MS detector response profile. All laboratories will follow the QA/QC criteria described in the analytical method. Those results will be stored at each laboratory for review at a later date, if necessary. If significant differences are observed between Bonner Analytical & Testing's results and Mississippi States University Chemical Laboratory'results, BATCO will send the extracts of these samples to a third party laboratory to investigate the reasons for these differences.

GC column: 30-meter X 0.25-mm (or 0.32-mm) DB-5 fused silica capillary column, as specified in Paragraph 4.1.2 in U.S. EPA SW-846 Method 8270.

GC oven and injector conditions: As specified in Paragraph 7.3 in SW-846 Method 8270.

The specifications given in Method 8270, Section 4.0, "APPARATUS AND MATERIALS," and Section 5.0, "REAGENTS," will be followed. The guidance in Section 7.0, "PROCEDURE" will be used to perform the GC separations and GC/MS identification and quantitation. Specific criteria for peak identification are given in Section 7.6 of the method. The characteristic ions, both primary and secondary ions, listed in Table 1 of the method will be used. For cis and trans dioxathion and dioxenthiol, the primary ion is m/z 97 with secondary ions at m/z 125, 270, and 153. Instrument tuning criteria are given in Table 3 of the method. For the Internal Standard, chrysene-d_{12} is recommended because it meets the retention time criteria set forth in Section 7.3.2.

7.) GENERAL COMMENTS

a.) All samples will be extracted and analyzed within the normal holding times for organophosphorus compounds.

b.) The dioxathion standard to be used by all laboratories will be supplied by the Hercules Incorporated.

c.) Water samples spiked with cis or trans dioxathion or dioxenethiol will be prepared by the Mississippi State Department of Environmental Quality (MSDEQ) personnel and distributed to each laboratory for inclusion in this study.

d.) Within three weeks of receipt of samples, all results of analyses and all confirmatory results will be reported to MSDEQ, who will collate them and distribute the results to the participating laboratories.

e.) A meeting will be held to review the results of analyses and to decide the next step in the implementation of the analytical methods to be used in monitoring well water samples from the Hercules Incorporated Hattiesburg plant.

f.) After its approval of this sampling and analysis protocol, MSDEQ will determine the time frame for the completion of all sampling and analysis activities and will set the date and time of the review meeting.

g.) Only results greater than or equal to the Limit of Quantitation will be reported. The numerical sum of the cis and trans isomers of dioxathion will be reported as dioxathion. Dioxenethiol will be reported as separate compound.