Michigan Potash Operating, LLC

MICHIGAN POTASH OPERATING, LLC

NON-HAZARDOUS
CLASS I UNDERGOURND INJECTION
OSCEOLA COUNTY, MICHIGAN

THE UNITED STATES POTASH PROJECT
JANUARY 2015

Sleeping Bear Dunes, Leelanau County, Michigan, Source, EPA, Region 5

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MICHIGAN STATE HISTORIC PRESERVATION OFFICE, APPLICATON FOR REVIEW

OMB No. 2040-0042 Approval Expires 11/30/2014

United States Environmental Protection Agency

Underground Injection Control Permit Application

(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)

I. EPA ID Number		T/A	C
U			

Read Attached Instructions Before Starting

For Official Use Only

Application approved mo day year	Date received mo day year	Permit Number	Well ID	FINDS Number

II. Owner Name and Address			III. Operator Name and Address		
Owner Name: Michigan Potash Operating, LLC			Owner Name: Michigan Potash Operating, LLC		
Street Address: 1225 17th Street, Suite 2200, c/o Fox Rothschild		Phone Number: (231) 577-9616	Street Address: 1225 17th Street, Suite 2200, c/o Fox Rothschild		Phone Number: (231) 577-9616
City: Denver	State: CO	ZIP CODE: 80202	City: Denver	State: CO	ZIP CODE: 80202

IV. Commercial Facility	V. Ownership	VI. Legal Contact	VII. SIC Codes
☐ Yes ☒ No	☒ Private ☐ Federal ☐ Other	☐ Owner ☒ Operator	1479

VIII. Well Status *(Mark "x")*

☐ A Operating	Date Started mo day year	☐ B. Modification/Conversion	☒ C. Proposed

IX. Type of Permit Requested *(Mark "x" and specify if required)*

☒ A. Individual ☐ B. Area	Number of Existing Wells	Number of Proposed Wells	Name(s) of field(s) or project(s)
	0	1	MPC 1D

X. Class and Type of Well *(see reverse)*

A. Class(es) (enter code(s))	B. Type(s) (enter code(s))	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
I	I		

XI. Location of Well(s) or Approximate Center of Field or Project

Latitude Deg	Latitude Min	Latitude Sec	Longitude Deg	Longitude Min	Longitude Sec	Township and Range Sec	Twp	Range	1/4 Sec	Feet From	Line	Feet From	Line
43	49	33.4	85	19	22.8	31	17N	8W	NW	1051	N	376	W

XII. Indian Lands (Mark 'x')

☐ Yes
☒ No

XIII. Attachments

(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)

For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.

XIV. Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibliity of fine and imprisonment. (Ref. 40 CFR 144.32)

A. Name and Title *(Type or Print)*	B. Phone No. *(Area Code and No.)*
Theodore A. Pagano, General Manager	(231) 577-9616
C. Signature	D. Date Signed: 01/13/2015

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☐ A Operating	Date Started mo day year	☐ B. Modification/Conversion	☒ C. Proposed

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☒ A. Individual ☐ B. Area	Number of Existing Wells	Number of Proposed Wells	Name(s) of field(s) or project(s)
	0	3	MPC 2D

X. Class and Type of Well *(see reverse)*

A. Class(es) (enter code(s))	B. Type(s) (enter code(s))	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
I	I		

XI. Location of Well(s) or Approximate Center of Field or Project

Latitude Deg	Latitude Min	Latitude Sec	Longitude Deg	Longitude Min	Longitude Sec	Township and Range Sec	Twp	Range	1/4 Sec	Feet From	Line	Feet From	Line
43	49	33.4	85	19	22.5	31	17N	8W	NW	1050	N	396	W

XII. Indian Lands (Mark 'x')

☐ Yes
☒ No

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☐ A Operating	Date Started mo day year	☐ B. Modification/Conversion	☒ C. Proposed

IX. Type of Permit Requested *(Mark "x" and specify if required)*

☒ A. Individual	☐ B. Area	Number of Existing Wells	Number of Proposed Wells	Name(s) of field(s) or project(s)
		0	1	MPC 3D

X. Class and Type of Well *(see reverse)*

A. Class(es) (enter code(s))	B. Type(s) (enter code(s))	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
I	I		

XI. Location of Well(s) or Approximate Center of Field or Project / **XII. Indian Lands (Mark 'x')**

Latitude Deg	Latitude Min	Latitude Sec	Longitude Deg	Longitude Min	Longitude Sec	Township and Range Sec	Twp	Range	1/4 Sec	Feet From	Line	Feet From	Line	XII. Indian Lands
43	49	06.4	85	19	33.8	36	17N	9W	SE	1168	N	442	E	☐ Yes ☒ No

XIII. Attachments

(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)

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A. Name and Title *(Type or Print)*	B. Phone No. *(Area Code and No.)*
Theodore A. Pagano, General Manager	(231) 577-9616
C. Signature	D. Date Signed: 01/13/2015

INTRODUCTION

I. NEED FOR PROPOSED ACTION

Potassium is one of the three primary nutrients essential to support carbohydrate production and plant life. Potassium is supplied in natural fertilizers to improve productivity, efficiency, and yields of agribusiness.

The major source of potassium is potash (potassium chloride), extracted form sylvinite, a naturally occurring mineral containing both potassium chloride (potash) and sodium chloride (table salt). Since 1965, world consumption of potash grew from 12 million tons, to an approximate 58 million tons today. In 50 years, potash consumption has almost quadrupled. In the last two decades, potash consumption has doubled.

The American farmer, the most efficient in the world, consumes about six million tons of potash annually and globally, pays more than any other farmer. Over 86% of U.S. potash consumption is imported. Domestic potash supply comes principally from the Designated Potash Area in New Mexico; established in 1939 as a strategic resource, it has been and remains protected by the Secretary of the Interior. Over the past 80 years, the Designated Potash Area has become critically depleted. In December of 2014, one of the two potash producers based in the United States will cease potash production from the Designated Potash Area, citing depletion and low ore grade.

Despite being required for food growth, potash is the world's tightest controlled commodity. It is utilized throughout the globe, but commercial production occurs in only 13 countries and from 13 companies.

The American farmer, the most efficient in the world, consumes about nine million tonnes of potash annually, but over 86% is imported, making the potassium fertilizer the farmer's highest cost to produce our food. Known domestic potash deposits are nearing depletion, and within the next twenty years, US potash production will have declined an additional 34%, and import reliance will have increased to over 90%.

The State of Michigan controls *one of three* domestic supplies for potash. Michigan potash was discovered in 1980, making it the youngest global commercial deposit of sylvinite.

Michigan has the only proven and probable, commercial, potash available and ready for development.

Fertilizer is the American farmer's greatest cost of production. Further increase in U.S. imports and tighter control of potash could lead to a distressed us farmer, less staple crop growth, exports, loss of jobs, revenues, and taxes, which in turn could lead to future shortages, price instability, and significantly higher costs and food costs.

Michigan's potash is critically important to the American farmer, who provides our food.

- The State of Michigan, as a contributive part of the U.S. soybean and corn belt, resides within the greatest potash demand region in all of North America.
- The State of Michigan contains the world's purest and highest grade potash and it resides in the U.S. corn belt, closest to the U.S. farmer.
- Discovered in 1980, and successfully produced since 1989, this concentrated area is only *one of three* potash producing regions in the United States. The other two have been critically depleted.
- The known, delineated, deposit in Michigan has the capability to double domestic potash production for over a century.

The proposed action will:

- Create a competitive potassium fertilizer price for the US farmer, which helps the noblest of professions. Helping our farmer, means supporting their choice to 'keep the farm' and grow food for us.
- Provide domestic production of a material critical to the US farmer, the nation's agricultural health, and the nation's food security.
- Reduce the need for import and improve the nation's balance of trade.
- Reduce transportation costs to key agricultural areas throughout the US.
- Create a new and sizable opportunity in Rural Western Michigan, providing jobs directly and indirectly to an area with a great need.

II. ALTERNATIVES TO THE PROPOSED ACTION

There are no commercial alternatives for potash.

III. THE PROPOSED ACTION

The proposed action is the perpetuation of pre-established potash production from Hersey Michigan.

Michigan potash deposits occur at great depths, over 7,600' below ground level. Therefore, deep wells, similar to the one proposed in this Class I NON-HAZARDOUS application, are utilized to access the deposit. This creates a favorable means of potash extraction, which impacts less than 3.5% of the surface. In other words, there is minimal to no surface disturbance, substantially reducing environmental impact and risk.

During the manufacturing of potash, sodium chloride, or "table salt", is also made. Michigan Potash Operating does make food grade quality salt, but there is an excess, and therefore, some salt has to be re-dissolved and re-injected. This is the purpose of the subject Class I NON-HAZARDOUS injection permit. The Proposed Action requires that excess salt water be re-injected.

The drilling and operation of wellbores such as these, in the state of Michigan are currently subject to approval and permitting processes governed separately by the U.S. Environmental Protection Agency (EPA) and the Michigan Department of Natural Resources (DNR).

The EPA's Underground Injection Control Permit Application, call for submittal of comprehensive project supporting data in the form of a series of attachments designated A through U; attached hereto and respectfully submitted for review.

Michigan Potash Operating proposes to drill and complete three non hazardous, Class I brine injection locations.

The non hazardous brine to be disposed is salt water only. The proposed facilities are non-commercial; in other words, can not be used to dispose of fluids for any purpose other than for potash and salt mining by Michigan Potash Operating, LLC or its affiliates; thereby, placing stringent control and supervision over the fluids being injected. Restated, the fluids being injected is non-hazardous, salt water, only from Michigan Potash Operating, LLC and/or its affiliates.

Michigan Potash Operating's sole business purpose is to intelligibly and carefully handle salt water that is created from the making of natural agricultural fertilizer that American farmers must have to grow our food.

MICHIGAN POTASH

BRIEF

Michigan Potash Operating proposes to drill and complete three (3) Class I, Type I injection wells for the purpose of putting non hazardous salt water into the selected injection horizons.

The wells are located in rural western Michigan, Osceola County; more specifically

Well Name : MPC 1D
Location: Township 17 North, Range 8 West, Evart Township, Michigan Meridian
Surface: Section 31: NW/4
SHL Lat, Long: 43.825947, -85.323008
Vertical Well

Well Name : MPC 2D
Location: Township 17 North, Range 8 West, Evart Township, Michigan Meridian
Surface: Section 31: NW/4
SHL Lat, Long: 43.825948, - 85.322932
Bottom: Section 30: SW/4
BHL Lat, Long: 43.832871, -85.322873
Directional Well

Well Name : MPC 3D
Location: Township 17 North, Range 9 West, Hersey Township, Michigan Meridian
Surface: Section 36: SE/4
SHL Lat, Long: 43.818448, - 85.326073
Vertical Well

The area of review is an active oil and gas devleopmetn area. It is also an active Class I and Class III injection well area. The area of review has been extensively reviewed and permited via prior approved and currently active Class I and Class III permits and oil and gas well drilling.

The proposed injection horizons, from deepest to shallowest, and from primary to tertiary objectives, are the: (1) Bass Island Dolomite (5,400' below surface); the (2) Sylvania Sandstone (5,170' below surface) and the (3) Reed City Dolomite (3,940' below surface). All three proposed injection horizons are well established injection horizons, with extensive studies and pre-established history of injection.

Extensive work has been performed to identify and understand the lowermost underground source of drinking water within the AOR and immediately offset the proposed wells. The lowest possible USDW is the base of the glacial till. The deepest occurance of glacial till in the AOR is 614 feet. Below the glacial till and into the Jurassic redbeds, TDS is typically in excess of 35,000. The AOR is basin centered, whereby, TDS tends to increase rapidly in the Jurassic redbeds.

Opearting procedures, and environmental, health, and safety precautions are well established due to well understood provided pre-established operations in the immediate area of review; where active Class I and Class III wells have been operational for over 25 years.

US EPA CHECKLIST CROSS REFERENCE

MICHIGAN/INDIANA
PERMIT APPLICATION CHECKLIST FOR CLASS I INJECTION WELLS
(Keyed to subsections of the Underground Injection Control permit application form)

ATTACHMENT.SECTION	USEPA CHECK	
		A. AREA OF REVIEW
		In Region 5, the Area of Review (AOR) is a set at a minimum fixed radius of 2 miles for non-hazardous wells; or the larger of the calculated Cone of Influence or a 2 mile radius, for hazardous wells.
F.2	_____	___Depth of top of proposed injection interval
H.2	_____	__ Known or estimated pre-injection pressure at top of injection interval
I.3	_____	__ Known or estimated specific gravity of formation fluid at top of injection interval
D.3	_____	__ Depth of bottom of lowermost aquifer which qualifies as an Underground Source of Drinking Water (USDW)
D.3	_____	__ Hydrostatic head (or static water level) of lowermost USDW
H.2	_____	__ Expected or modeled maximum pressure buildup in the injection interval
		B. MAPS OF WELLS/AREA OF REVIEW
Figure A2	_____	Topographic map of AOR or area extending at least 1 mile beyond property boundaries, whichever is greater, showing the following: (Only items of public record are required.)
B.1	_____	__ Each major intake and discharge structures for liquid waste
B.2	_____	__ Each hazardous waste treatment, storage, or disposal facility
C.1	_____	__ Number, name and location of all producing wells
C.2 & C.3	_____	__ Number, name and location of all injection wells of all classes
C.4	_____	__ Number, name and location of all abandoned wells, plugged wells, and dry holes
B & F	_____	__ Known or suspected faults
C.5	_____	__ Location of all water wells of public record or otherwise known to the applicant, within the AOR or within a quarter mile of the facility property boundary, whichever is greater
Figure B5	_____	__ Bodies of water, springs, surface and subsurface mines and quarries, residences, and roads within the AOR, or within a quarter mile of the facility property boundary, whichever is greater
		The following information is also required:
C.7	_____	__ List of names and addresses of all owners of record of land within a quarter mile of the facility boundary, unless waived by the Director.
C.8	_____	__ A description of the methods used to locate wells in the AOR.
		C. CORRECTIVE ACTION PLAN AND WELL DATA
C.6	_____	__ Corrective action plan for inadequately plugged wells in the AOR which penetrate the top of the confining zone
		The following information should be submitted for all wells in the AOR which penetrate the top of the confining zone:
C.1 & C.2 & C.3 & C.4	_____	__ Well construction, date of construction and total depth
C.1 & C.2 & C.3 & C.4	_____	__ Well operator/owner
APPENDIX 1	_____	__ Cement records
APPENDIX 1	_____	__ Plugging records
Figure B1-B8	_____	__ Distance from proposed injection well
		D. MAPS AND CROSS SECTIONS OF USDWs
Figure D1	_____	__ Stratigraphic column of site which indicates all USDWs
Figure D2	_____	__ Data substantiating the depth of the lowermost USDW, if available
		E. DOES NOT APPLY TO CLASS I WELLS
		F. MAPS AND CROSS SECTIONS OF GEOLOGIC STRUCTURE OF AREA
Figure F9-F13	_____	__ Cross sections and structure contour maps adequate to describe the regional geology of the area, including especially any faults
Figure F9	_____	__ Cross sections of site-specific geology, including any faulting in the AOR

Figure F6-F8	_____	__ Geologic description of confining zone (including lateral extent, lithologies, thicknesses, permeabilities, porosities, extent of natural or induced fractures, etc.)
Figure F6-F8	_____	__ Geologic description of injection zone (including depth, lateral extent, lithology, thickness, permeability, porosity, presence of natural or induced fractures, etc.)
Figure F14	_____	__ Page-sized (8 1/2" x 11") diagram showing well construction and corresponding site stratigraphy
		G. DOES NOT APPLY TO CLASS I WELLS
		H. OPERATING DATA
H.1	_____	__ Estimated average and maximum injection rate and volume
H.2	_____	__ Estimated average and maximum injection pressures
H.4	_____	__ Source(s) of waste (brief description of industrial process(es) which produce the waste)
H.4	_____	__ A representative waste analysis (including all major constituents and, for hazardous wastes,
H.5	_____	all hazardous constituents and characteristics)
H.6	_____	__ Plans for corrosion monitoring, if the waste is corrosive
		I. FORMATION TESTING PROGRAM
I.1	_____	__ Procedures to verify depth of lowermost USDW, if needed
I.2	_____	__ Procedures to obtain extrapolated formation pressure in porous and permeable zones within approximately 500 feet of the top of the injection zone (non-hazardous wells) or injection interval (hazardous wells)
I.3	_____	__ Sampling and analysis procedures for formation fluid of 1. the first aquifer overlying confining zone (hazardous and non-hazardous waste wells), 2. the injection zone (non-hazardous waste wells) or injection interval (hazardous waste wells), and 3. the containment interval (hazardous waste wells only)
Figure F6-F8 & I.4	_____	__ Cores and laboratory core testing for confining and injection zones (For non-hazardous waste wells, a minimum of one 30-foot core of the confining zone and one 30-foot core of the injection zone are required. For hazardous waste wells where injection of restricted wastes is proposed, one or more cores of the containment interval will also be necessary)
I.5	_____	__ Determination of fracture closure pressure of injection zone (nonhazardous wells) or injection interval (hazardous wells)
I.6	_____	__ Injectivity/fall-off testing of injection zone/interval, including interference testing if multiple wells are proposed
ATTACHEMENT J.	_____	**J. STIMULATION PROGRAM**
		Class I wells are not recommended in areas where fracture stimulation will be necessary. If it is proposed, procedures should be included in the permit application which show how the operator proposes to confine fractures to the injection formation. If acid or other type of stimulation is proposed, procedures should also be included in the permit application under this section.
		K. INJECTION PROCEDURES
Figure K1	_____	__ Plant plan showing flow line of waste stream(s) to be injected
K.2	_____	__ Description of filters, storage tanks (including capacity), and any pretreatment processes and facilities, including location on plant plan
K.3	_____	__ Description of injection pumps, including rate capacity
k.4	_____	__ Description of annulus pressure maintenance system
k.5	_____	__ Description of alarm and shut-off system
		L. CONSTRUCTION PROCEDURES
L.1	_____	__ Detailed well construction procedures
L.2	_____	__ Estimated time table for drilling, logging and formation testing
L.3	_____	__ Proposed open-hole and cased hole logs
L.4	_____	__ Proposed mechanical integrity testing (cement bond logs, radioactive tracer log, and temperature, noise or oxygen activation log are required prior to injection of waste)

L.5	_____	__ Proposed buffer fluid and volume, if any
		M. CONSTRUCTION DETAILS
		The following information should be included in well schematics and/or tables:
M.1	_____	__ Proposed construction of well, including total depth, completion type, casing sizes, types, weights, and setting depths
M.2	_____	__ Proposed cement type and amount for all casing (All casings should be cemented to surface.)
M.3	_____	__ Tubing and packer specifications, including size, type, and setting depths
		__ Well head construction details
M.4	_____	__ Location of sample tap and female coupling for independent determination of annulus pressure
		N. DOES NOT APPLY TO CLASS I WELLS
ATTACHEMENT O		**O. PLANS FOR WELL FAILURES**
		The applicant should submit contingency plans for 1. actions that will be taken if mechanical integrity of well is lost and 2. storage or alternate treatment or disposal of waste in the case of emergency shut-in.
		P. MONITORING PROGRAM
APPENDIX 2	_____	__ Waste Analysis Plan (see guidelines)
P.2	_____	__ Description of monitoring and recording system for injection pressure, rate, and volume, and for annulus pressure
P.3	_____	__ Description of sight glass level monitoring and recording, if a seal pot system of annulus pressure maintenance is proposed
P.4	_____	__ Groundwater monitoring plan and Quality Assurance Project Plan (In most cases, this will be necessary for new wells injecting restricted hazardous wastes. Region 5's two guidance on groundwater monitoring should be followed.)
		Q. PLUGGING AND ABANDONMENT PLAN
Q.1-Q.2	_____	__ Signed plugging and abandonment form, showing amount and type of cement, placement method, and estimated cost. (Region 5 requires a cement plug to extend from the base of the lowermost casing to the surface.)
Q.2	_____	__ Signed estimate of plugging and abandonment costs (and post-closure costs, if applicable) by an independent firm
Q.3	_____	__ Closure plan, including plans to acquire a representative fluid sample from the first aquifer overlying the injection zone (Only necessary for wells which inject restricted hazardous wastes)
Q.4	_____	__ Post-closure plan, which covers the requirements of 40 CFR 146.72 (Only necessary for hazardous waste wells)
		R. NECESSARY RESOURCES
ATTACHEMENT R	_____	__ Signed mechanism of financial assurance sufficient to cover closure (and post-closure, if applicable) of well. (Applicants for both hazardous and non-hazardous waste wells should use 40 CFR 144, Subpart F as a guideline)
		S. AQUIFER EXEMPTIONS
N/A		Region 5 does not encourage applications for aquifer exemptions for Class I wells. If application is made, 40 CFR 146.4 may be used as a guideline.
		T. EXISTING EPA PERMITS
T.1	_____	Briefly describe activities which require the applicant to obtain permits under the RCRA, UIC, NPDES, or PSD programs. List all permits or construction approvals received or applied for at the facility where the well will be located, under any of the following programs:
T.1	_____	1. Hazardous Waste Management under RCRA
T.1	_____	2. UIC program under SDWA
T.1	_____	3. NPDES program under CWA
T.1	_____	4. Prevention of Significant Deterioration (PSD) program under the Clear Air Act
T.1	_____	5. Nonattainment program under the Clean Air Act
T.1	_____	6. Dredge and fill permits under section 404 of CWA
T.1	_____	7. Other relevant environmental permits, including State permits.

ATTACHEMENT U

		U. DESCRIPTION OF BUSINESS
	_____	__Briefly describe the nature of the business and list up to four SIC codes which best reflect the principal products or services provided by the facility.
		PRIOR RELEASES
N/A	_____	__ For existing wells, list the highest injection pressure in use in this well since construction and the approximate dates of injection near that pressure
N/A	_____	__ List of prior releases of waste through injection wells at this facility to intervals other than that proposed in this permit application
		IF THE PERMIT APPLICATION IS FOR HAZARDOUS WASTE INJECTION, THE APPLICANT MUST ALSO INCLUDE THE FOLLOWING:
N/A	_____	__ All applicable RCRA waste codes for listed and characteristic wastes proposed for injection in this well
N/A	_____	__ All applicable Land Disposal Restriction deadlines or "ban dates"
N/A	_____	__ Proposed schedule for submittal of exemption petition, if waste is restricted from land disposal
N/A	_____	__ Additional testing proposed to support the exemption petition
N/A	_____	__ Future plans for waste minimization and a certified statement which meets the requirements of 40 CFR 146.70(d)

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT A: AREA OF REVIEW

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHMENT A
AREA OF REVIEW METHODS

EPA instruction, form 7520-6 (2011):
AREA OF REVIEW METHODS - Give the methods and, if appropriate, the calculations used to determine the size of the area of review (fixed radius or equation). The area of review shall be a fixed radius of 1/4 mile from the well bore unless the use of an equation is approved in advance by the Director.

The area of review ("AOR") radius for non-hazardous wells was established by USEPA Region 5 guidance as a "fixed radius of 2 miles" around the proposed well location(s).

- **Figure A1** is a locator map, showing the proposed wellbore locations, located in Osceola, County Michigan.

- **Figure A2** is the AOR defined by connecting the arcs of 2-mile radii circles drawn around four proposed non hazardous brine injection locations. The radius of the AOR for non-hazardous wells was established by USEPA Region 5 guidance as a "fixed radius of 2 miles" around the Class I non hazardous injection well locations.

The AOR has been the subject of extensive and comprehensive prior geological and environmental review, and re-review by all interested stake holders and regulatory agencies and predecessor companies to Michigan Potash Operating, LLC, having been the subject of prior permit applications for both Class I and Class III non hazardous injection. Predecessor owners of interest include, Kalium Chemicals, Ltd., IMC Kalium, Ltd., PPG Industries, Inc, and Mosaic Hersey Potash, LLC.

- **Figure A3** is a graphical representation showing the AOR over historical AOR's. A portion of the documents surrendered here reference the vast resource of available data covering over 30 years of non hazardous brine injection within the AOR.

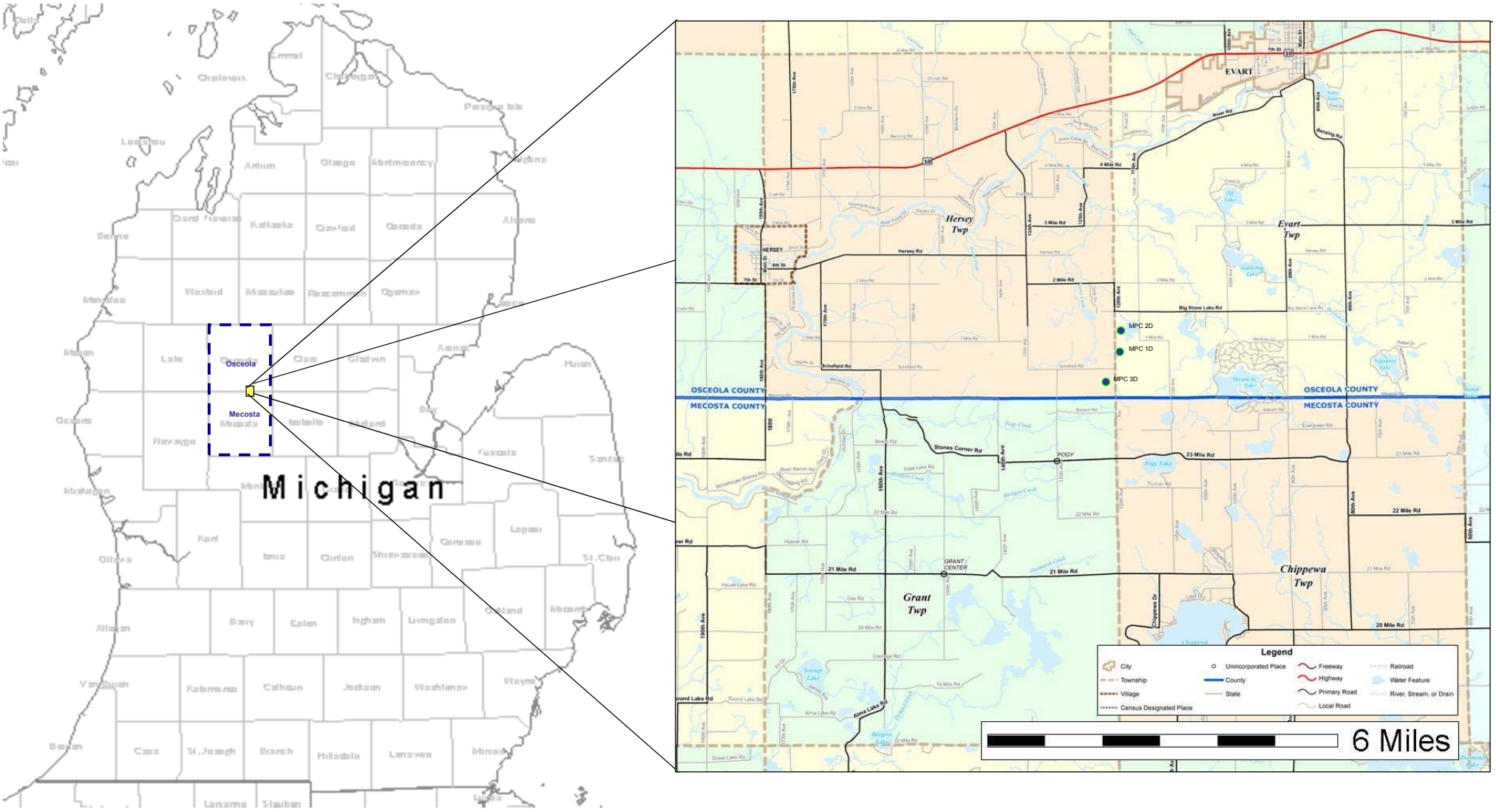

Figure A1. Locator Map, showing the proposed well locations. The well names are also shown.

MICHIGAN POTASH OPERATING, LLC

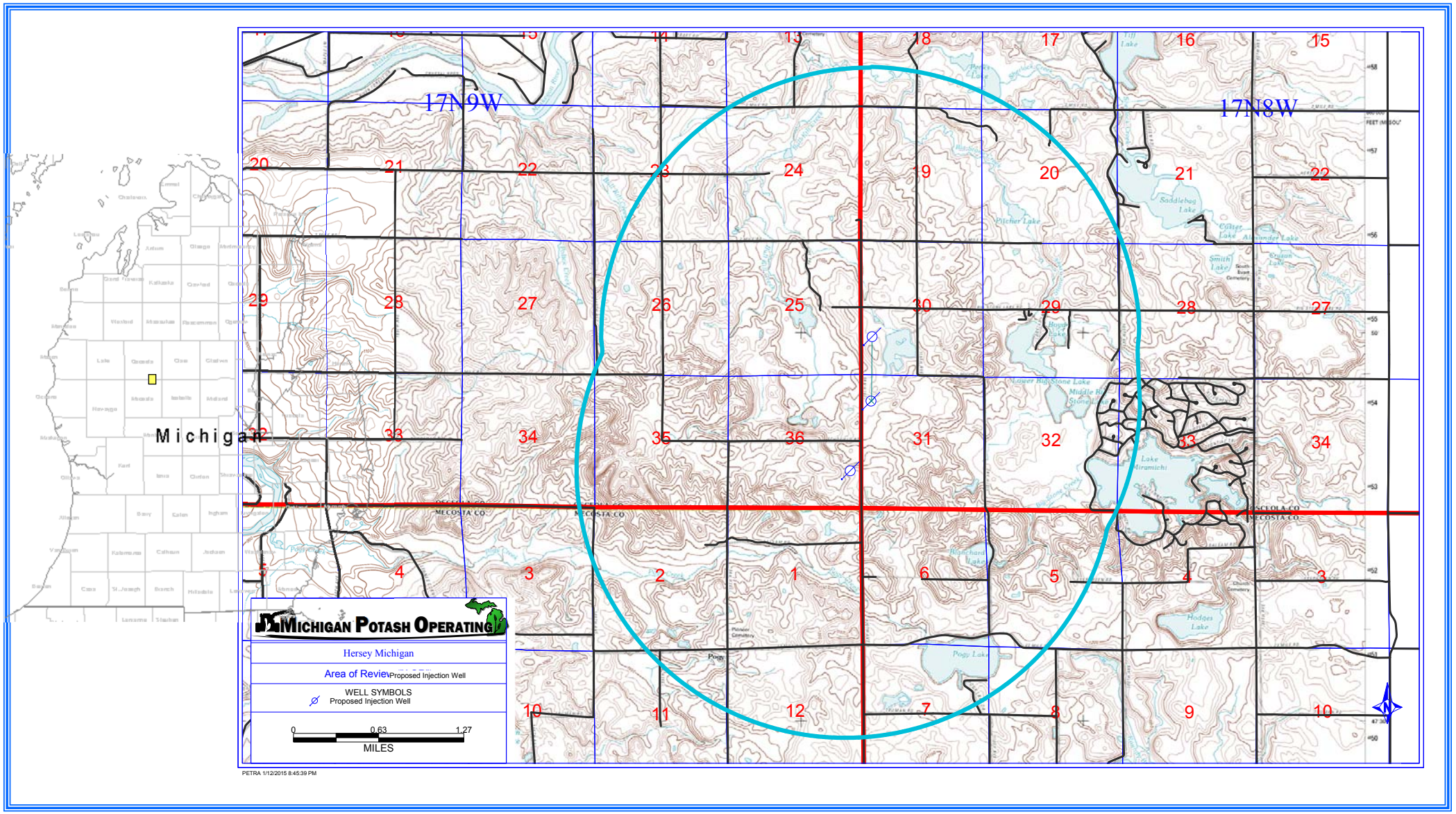

Figure A2. USGS Topographic Map extending one mile beyond the property boundaries and showing the project area and applicable area of review Also shows roads (Black) and Public Land Survey System (Blue).

MICHIGAN POTASH OPERATING, LLC

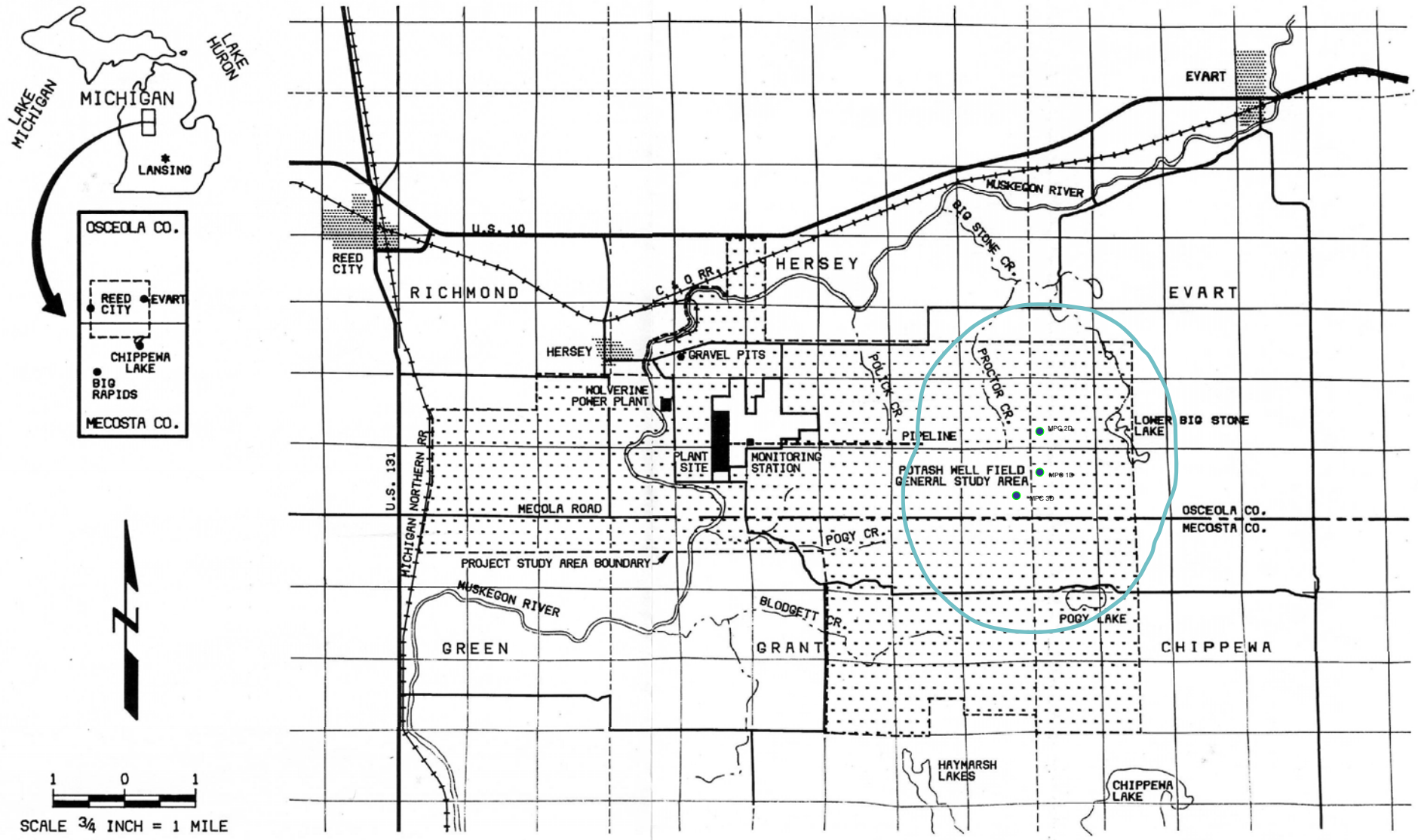

Figure A3. Map showing prior extensive studies covering the proposed AOR by Pittsburg Plate and Glass, under its Kalium Subsidiary, between 1980 and 1989. Also Showing the approximate proposed well locations.

MICHIGAN POTASH OPERATING, LLC

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT B: MAPS OF WELL/AREA AND AREA OF REVEW

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHMENT B
MAP OF WELLS/AREA OF REVIEW

EPA instruction, form 7520-6 (2011):

MAPS OF WELLS/AREA AND AREA OF REVIEW - Submit a topographic map, extending one mile beyond the property boundaries, showing the injection well(s) or project area for which a permit is sought and the applicable area of review. The map must show all intake and discharge structures and all hazardous waste treatment, storage, or disposal facilities. If the application is for an area permit, the map should show the distribution manifold (if applicable) applying injection fluid to all wells in the area, including all system monitoring points.

B.1 Major Intake and Discharge Structures for Liquid Waste

NO major intake and discharge structures for liquid waste were located in the AOR

B.2 Hazardous Waste, Storage or Disposal Facilities

There are NO hazardous wastes being generated within the AOR according to the Hazardous Waste Biennial Report.

The Hazardous Waste Report (Biennial Report) collects data on the generation, management, and minimization of hazardous waste. This provides detailed data on the generation of hazardous waste from large quantity generators and data on waste management practices from treatment, storage, and disposal facilities. The Biennial Report data provide a basis for trend analyses. Data about hazardous waste activities is reported for odd number years (beginning with 1989) to EPA. EPA then provides reports on hazardous waste generation and management activity that accompany the data files.

There have been NO hazardous waste releases within the AOR according to the Superfund, CERCLIS database.

Superfund is a program administered by the EPA to locate, investigate, and clean up the worst hazardous waste sites throughout the United States. Before Superfund, Americans were less aware of how dumping chemical wastes might affect public health and the environment. Hazardous wastes were often left in the open, where they seeped into the ground, flowed into rivers and lakes, and contaminated soil and groundwater. Consequently, where these practices were intensive or continuous, there were uncontrolled or abandoned hazardous waste sites. These sites include abandoned warehouses, manufacturing facilities, processing plants, and landfills. Citizen concern about the extent of this problem prompted Congress in 1980 to establish the Superfund Program to eliminate the health and environmental threats posed by hazardous waste sites.

There is ONE hazardous waste handler and registered FRS facility within the AOR according to RCRA Info via the Envirofacts Database Warehouse, listed below:

HANDLER NAME	HANDLER ID	ADDRESS	LAT	LONG	FRS ID
Mosaic Potash Hersey, LLC	MIR000004440	1395 135th Ave Hersey, MI 49639	43.8348	-85.3553	110001842436

Contact Information:

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
KARL TOMASZEWSKI	1395 135TH AVE	HERSEY	MI	49639	2318328838	Public
KARL TOMASZEWSKI	1395 135TH AVE	HERSEY	MI	49639	2318328838	Permit

Hazardous waste information is contained in the Resource Conservation and Recovery Act Information (RCRAInfo), a national program management and inventory system about hazardous waste handlers. In general, all generators,

transporters, treaters, storers, and disposers of hazardous waste are required to provide information about their activities to state environmental agencies. These agencies, in turn pass on the information to regional and national EPA offices. This regulation is governed by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984. You may use the Hazardous Waste Search to determine identification and location data for specific hazardous waste handlers, and to find a wide range of information on treatment, storage, and disposal facilities regarding permit/closure status, compliance with Federal and State regulations, and cleanup activities. There is also information on related Laws and regulations.

There are six Michigan Part 201 locations identified within the area of review as per the following; listed below:

SITENAME	SITE_ID	ADDRESS	POLLUTANTS	LATITUDE	LONGITUDE
Vukin 1-19 (PN 38463)	67000019		Cl; Brine/chlorides; Crude oil	43.84386	-85.31469
Wark 1-30 (PN 35977)	67000020		Cl; Brine/chlorides; Crude oil	43.84216	-85.31214
Kalium Chemicals	67000064	395 135th Ave and 11126 140th Hersey, MI 49639	Cl; Diesel fuel	43.84145	-85.36223
Paine 1-35 (PN 36186)	67000017		Cl; Brine/chlorides	43.82736	-85.35073
Paine 1-26 (PN 37317)	67000018		Cl; Brine/chlorides	43.83339	-85.34614

The Vukin 1-19 (Drilled and Abandoned), Wark 1-30 (Drilled and Abandoned), Paine 1-35 (Producing Gas Well, Clinton Formation), and Paine 1-26 (Producing Gas Well, Clinton Formation) are oil and gas wellbore locations. The Paine 1-35 and Paine 1-26 are currently producing natural gas.

There are NO distribution manifolds associated with this application.

ATTACHMENT B
MAP OF WELLS/AREA OF REVIEW CONTINUED:

EPA instruction, form 7520-6 (2011):
Within the area of review, the map must show the following:

For Class I NON HAZARDOUS
The number, or name, and location of all producing wells, injection wells, abandoned wells, dryholes, surface bodies of water, springs, mines (surface and subsurface), quarries, and other pertinent surface features, including residences and roads, and faults, if known or suspected. In addition, the map must identify those wells, springs, other surface water bodies, and drinking water wells located within one quarter mile of the facility property boundary. Only information of public record is required to be included in this map.

For brevity, to ease understanding, and to match the intent of form 7520-6, the remainder of ATTACHEMENT B has been limited to ***Maps and Map descriptions*** to illustrate the required EPA checklist items, as appears to be the intent of the instructions for form 7520-6 (2011). Additional comment and tabular data is found in subsequent and related ATTACHEMENTS.

For ease of reference and review, multiple graphical maps have been illustrated over the AOR. All of the maps in this section include the proposed injection well locations and the Public Land Survey System ontop of the United States Geological Survey Topographic Quadrangle for the AOR. Together, they fulfill all the checklist items as required by Federal Form 7520-6; as follows:

- **Figure B1** shows all producing wells in relation to the proposed injection wells in the AOR. The Public Land Survey System is included ontop of the United States Geological Topographic Quadrangle.

- **Figure B2** shows active Class I NON-HAZARDOUS Injection Wells; the Thomas 1-26 (NW4NW4 Section 26) and the Woodward 1-26 (NE4SW4 Section 26), both operated by Mosaic Hersey Potash, LLC.

- **Figure B3** shows established Class III *AREA* Injection Permit No. MI-133-3G-A0002 (Yellow Cross Hatch) and all Active and Inactive Class III Injection Wells. The AOR has undergone extensive prior regulatory review as a result of the active Class I and Class III wells in the immediate AOR.

- **Figure B4** shows all plugged wells, shallow or deep within the area of review. Total depths of the each well is listed next to its well symbol. Also shown on this map are the API Serial numbers. The serial number is illustrated and defined below:

State	–	County	–	**Serial**	–	Completion
21	-	133	-	#####	-	00-00

Mineral wells available to the public record or made known to the applicant are also shown. These wells are preceded with the letter "M" before the listed Serial No. The State of Michigan has adapted a 'pseudo API No,' utilizing the mineral permit number as an API Serial No. As an example; M4999 would have the equivalent Mineral Well API designation of :

State	–	County	–	**Serial**	–	Completion
21	-	133	-	0**4999**	-	**70**-00

These numbers can be quickly cross referenced with public records, and or the tabular sections following in ATTACHEMENT C.

- **Figure B5** specifically highlights and outlines all surface bodies of water and springs on the USGS topographic quadrangle 7 ½ minute series, in addition to showing all wells of public record and all roads.

  There are NO surface and subsurface mines.

  There are NO surface quarries.

  There are NO known faults. The Area of Review has been comprehensively studied by Michigan Potash Operating, LLC and numerous consultants and predecessor companies, geologically investigating the possibility of known faults. There are no known faults located within the Area of Review.

- **Figure B6** shows all surface residencies. Residences have been reviewed via the best available data, via tax roll data at the Osceola County Register and the Mecosta County Register; via conveyance records at the Osceola County Register of Deeds and Mecosta County Register of Deeds. Third party mailing lists were also requested, reviewed and geo referenced (converted to latitude-longitudinal coordinates). It is also expected that every water well accompanies a residence, and therefore, recorded water well addresses have also been included to illustrate residency locations.

- **Figure B7** shows all drinking water wells of public record or known within the AOR.

- **Figure B8**. Composite map of all of the above EPA checklist items, including topography, all major water features, producing wells, injection wells, plugged wells, water wells, residences, roads (black), the public land survey system, and Area Permit No. MI-133-3G-A0002.

Distances from all EPA Checklist items, including all wells of any kind of any nature can be determined via the scale on any of the above referenced figures.

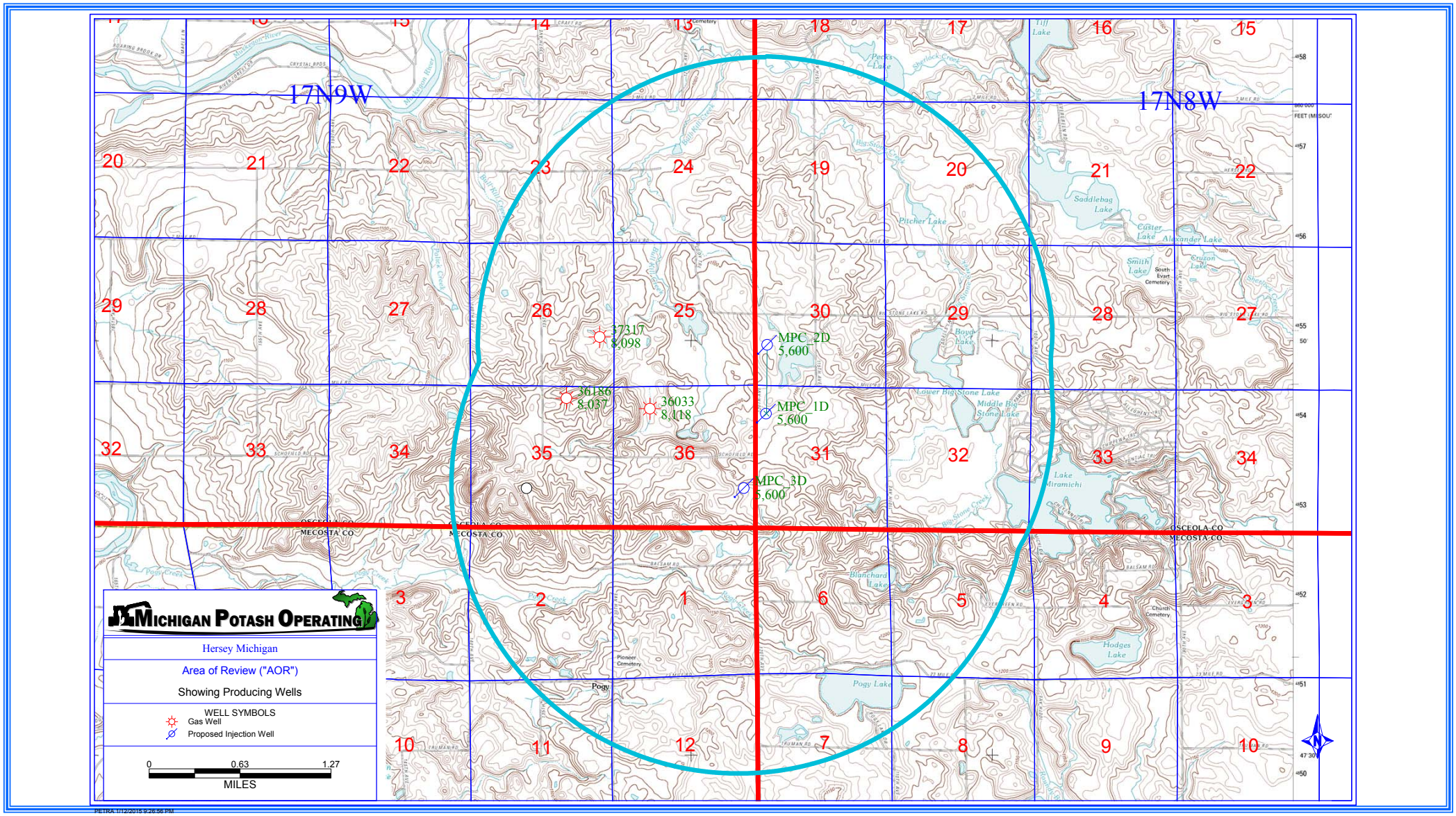

Figure B1. Map showing all producing wells in relation to the proposed injection wells. Public Land Survey System is included. A blue box measures one section, or one square mile.

MICHIGAN POTASH OPERATING, LLC

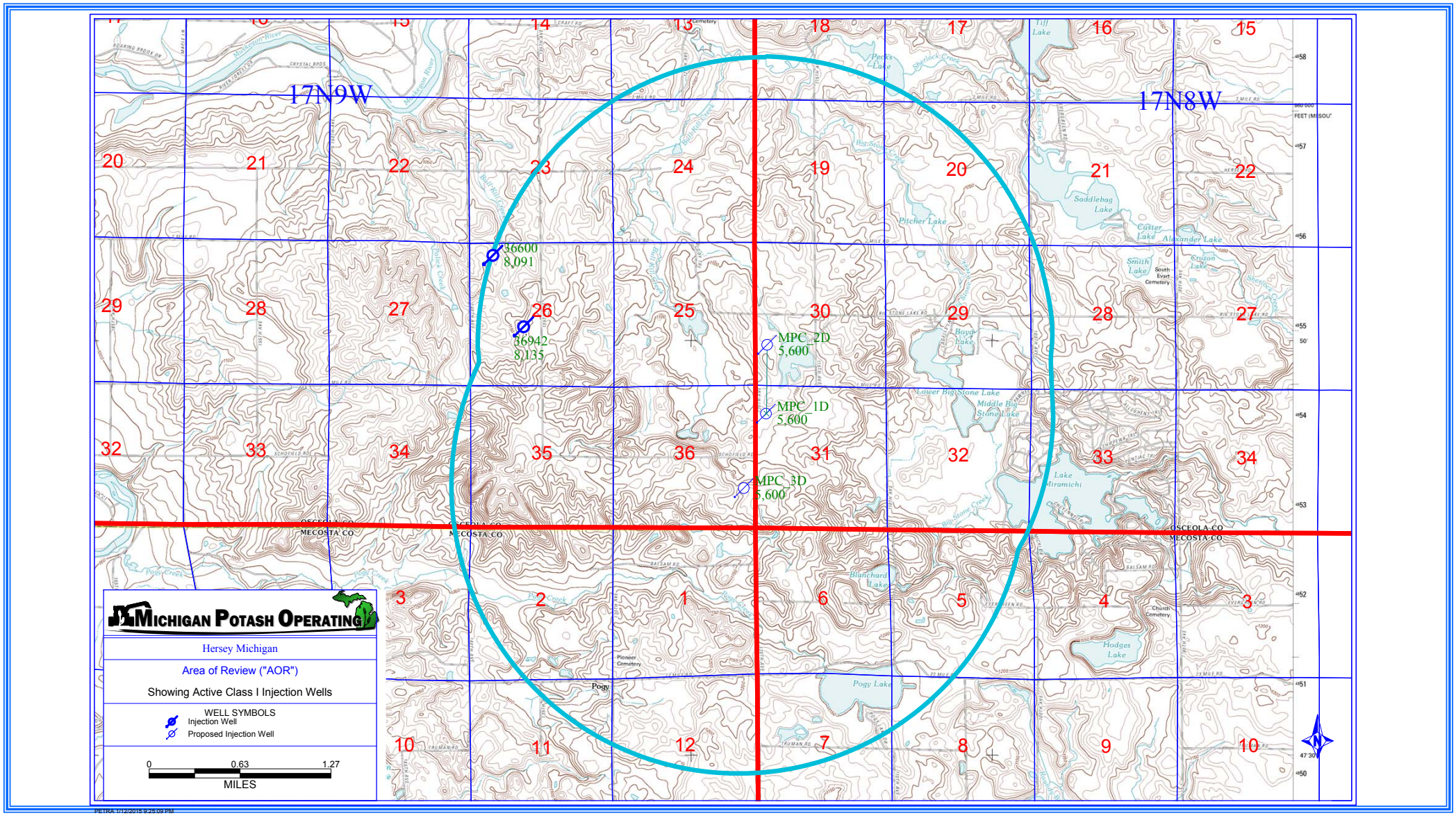

Figure B2. Map showing Existing Class I NON-HAZARDOUS Injection Wells, the Thomas 1-26 (NW4NW4 Section 26) and the Woodward 1-26 (NE4SW4 Section 26).

Michigan Potash Operating, LLC

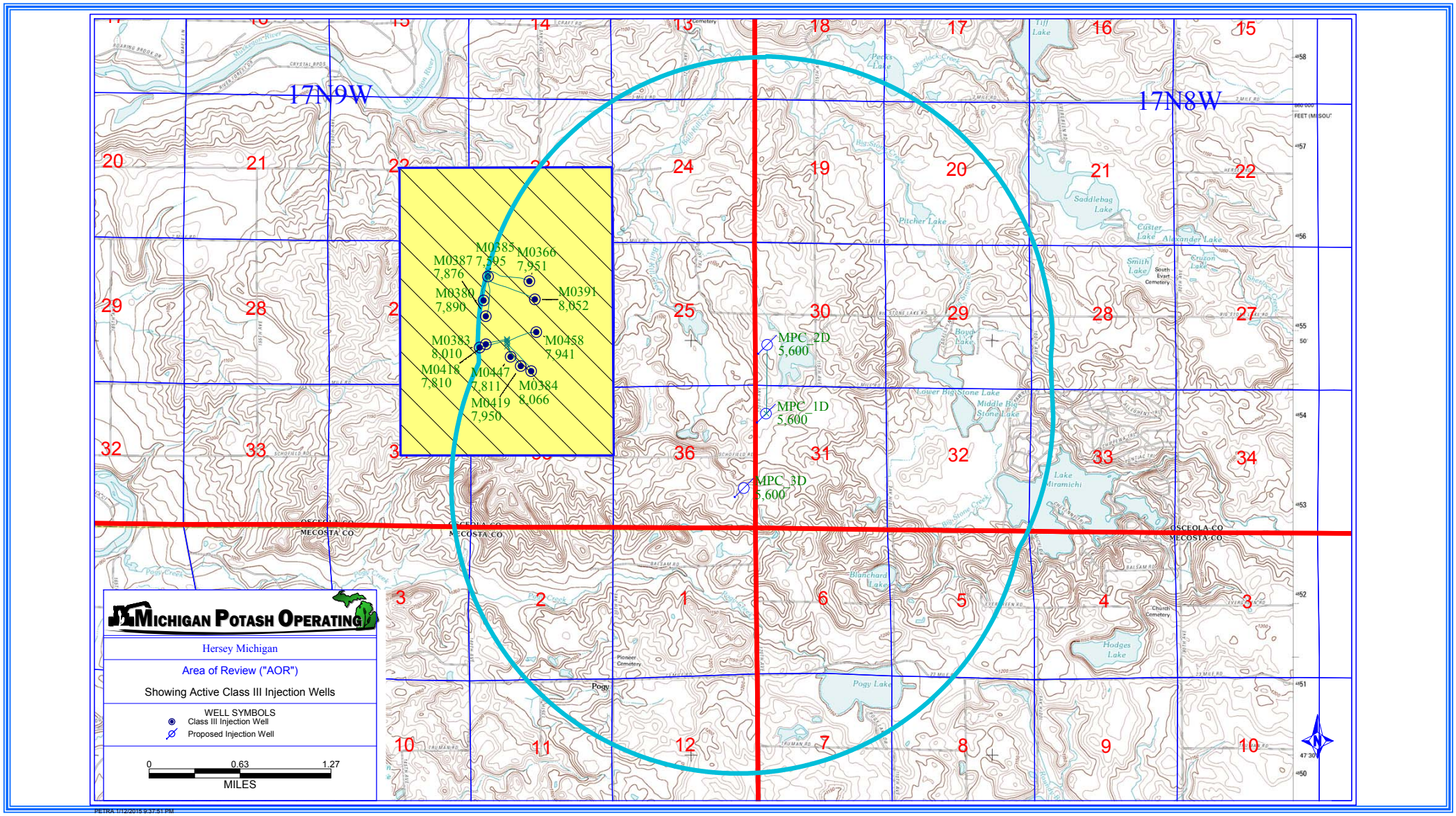

Figure B3. Map showing established Class III Injection Permit No. MI-133-3G-A0002 (Yellow Cross Hatch) and Active and Inactive Class III Injection Wells. The AOR has undergone extensive prior review.

Michigan Potash Operating, LLC

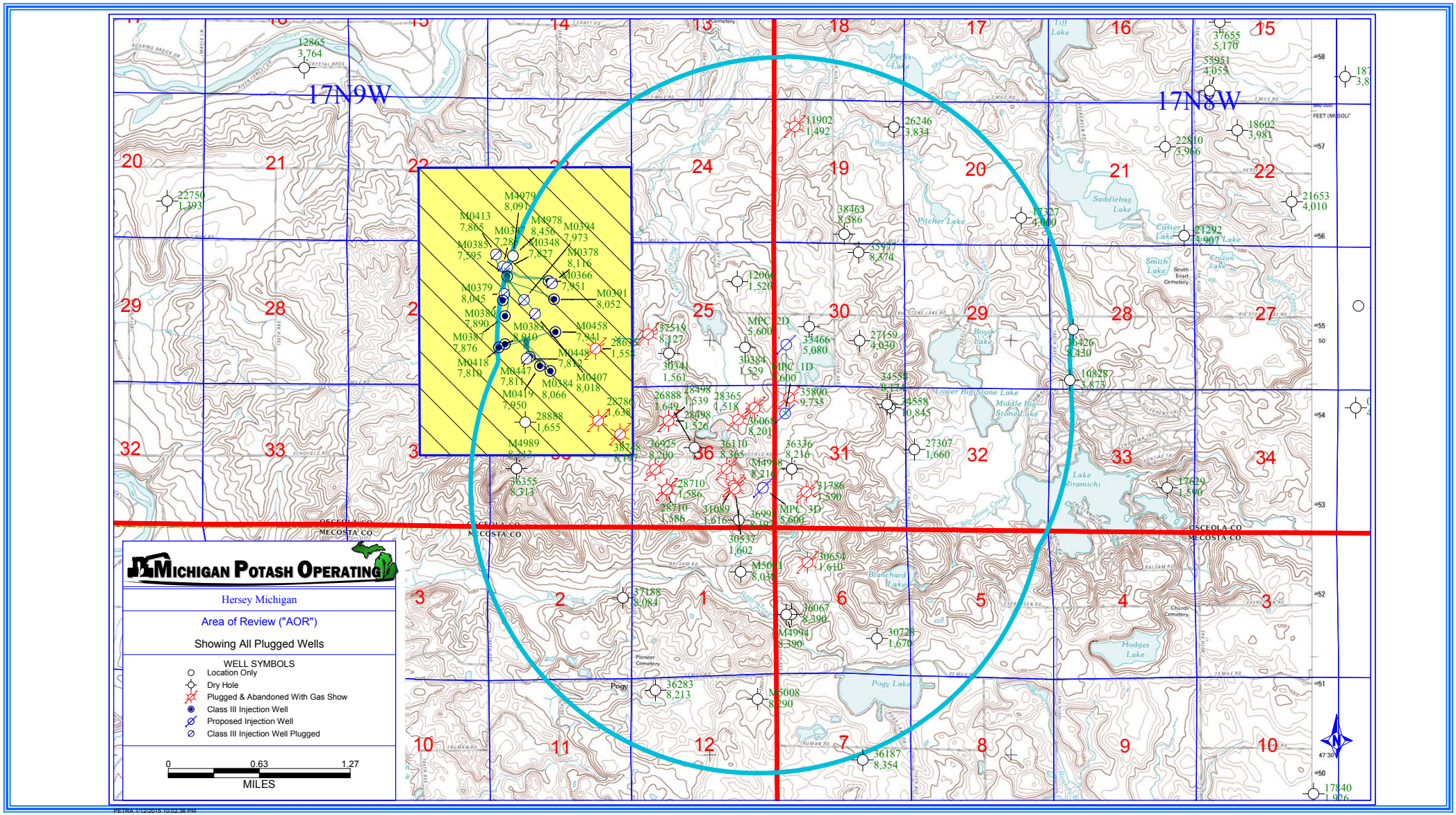

Figure B4. Map showing all plugged wells, shallow (that do not penetrate any confining horizon) or deep (that penetrate confining horzion) within the area of review. Total Depths are listed. There are several shallow Michigan Stray wells that do not penetrate the injection or confining horizon.

MICHIGAN POTASH OPERATING, LLC

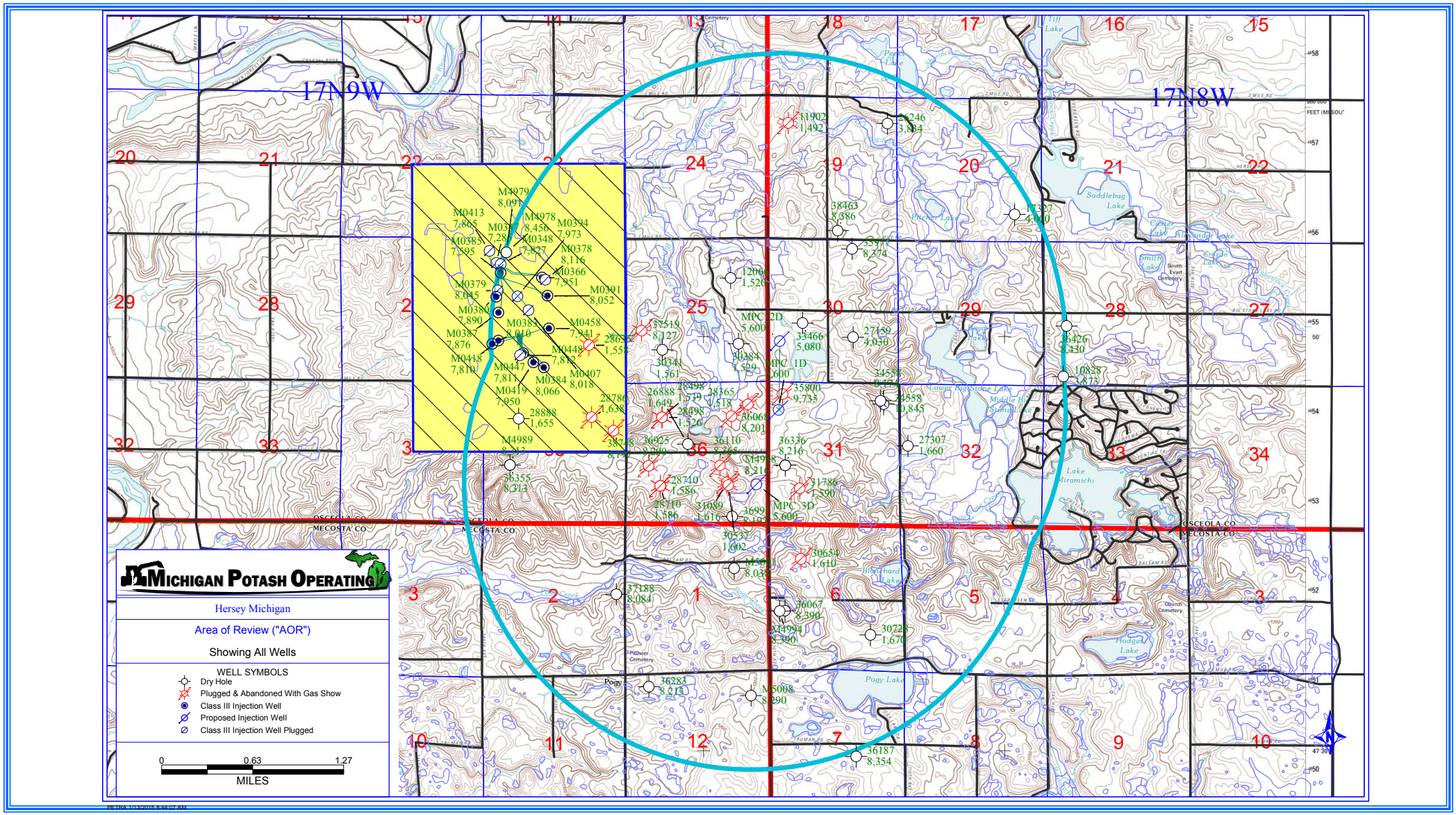

Figure B5. Map showing All well types, active and inactive, within the Area of Review. Shown in blue highlight are surface water bodies. Roads are also shown (black). PLSS is also shown (Blue). Well API series, and Total Depth are listed in GREEN. Mineral Wells are preceded with an M.

MICHIGAN POTASH OPERATING, LLC

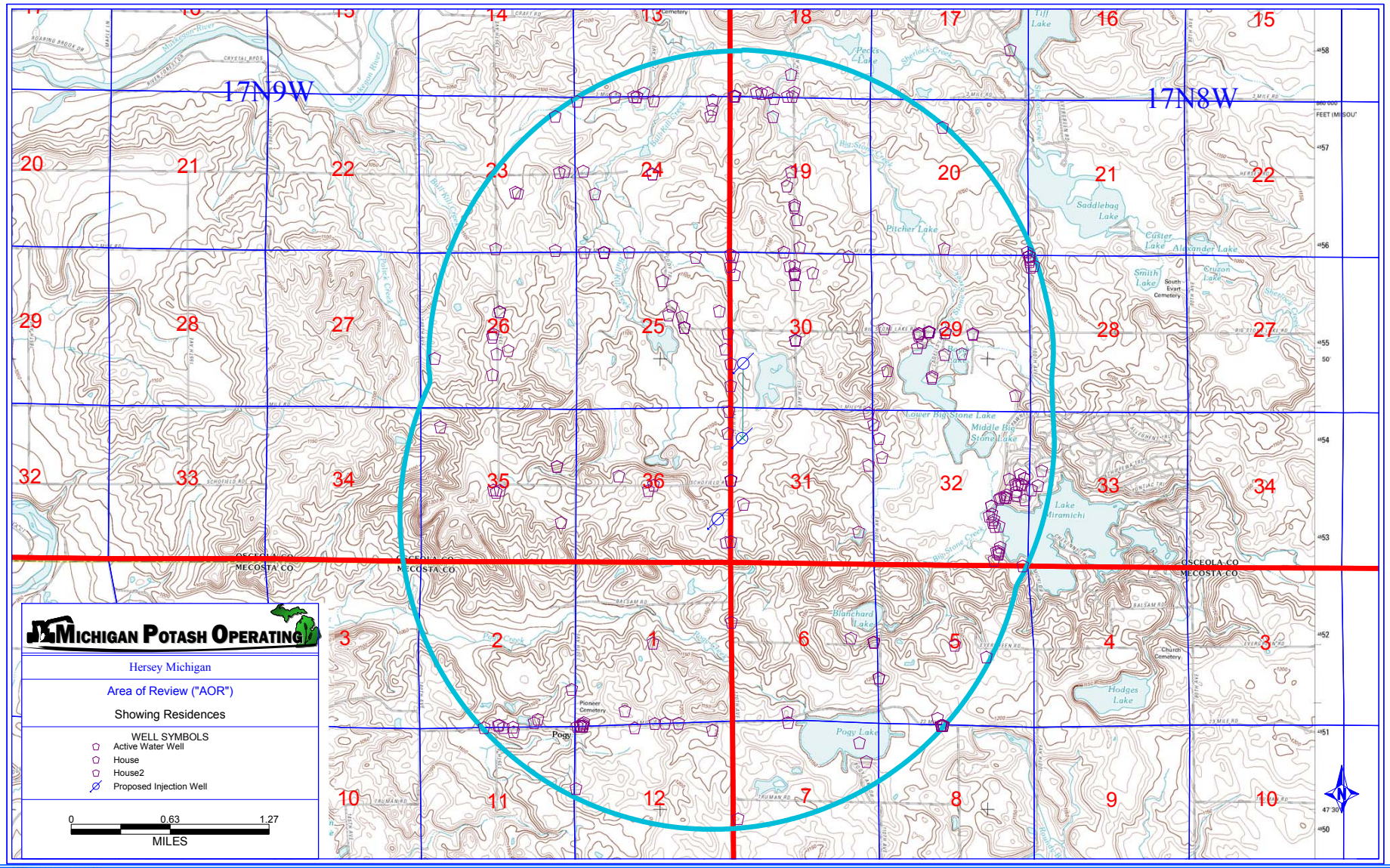

Figure B6. Map showing all residencies. Also showing roads (black), and PLSS (Blue).

MICHIGAN POTASH OPERATING, LLC

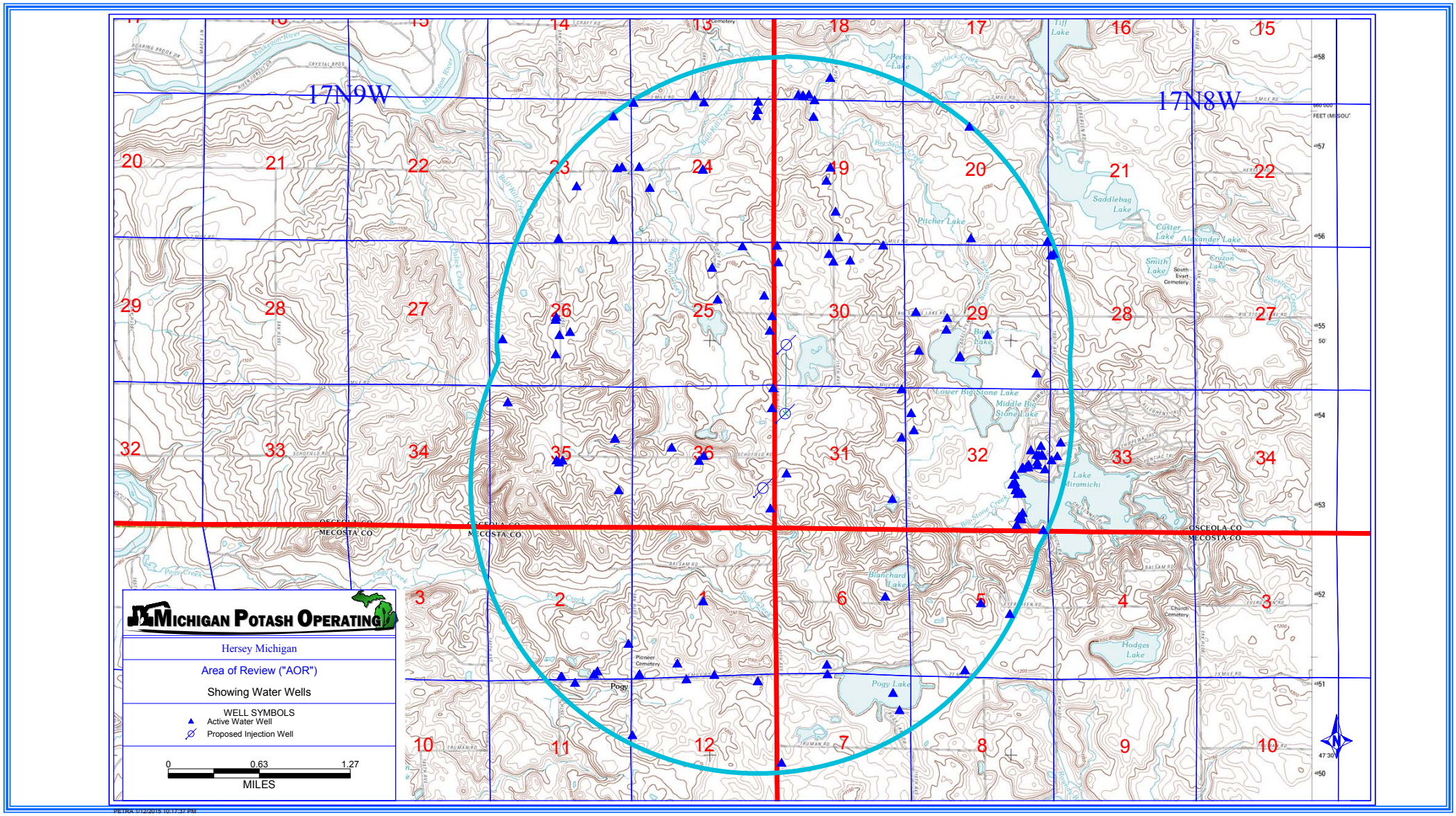

Figure B7. Map showing all water wells in the area of review in relation to the proposed injection wells and topography.

MICHIGAN POTASH OPERATING, LLC

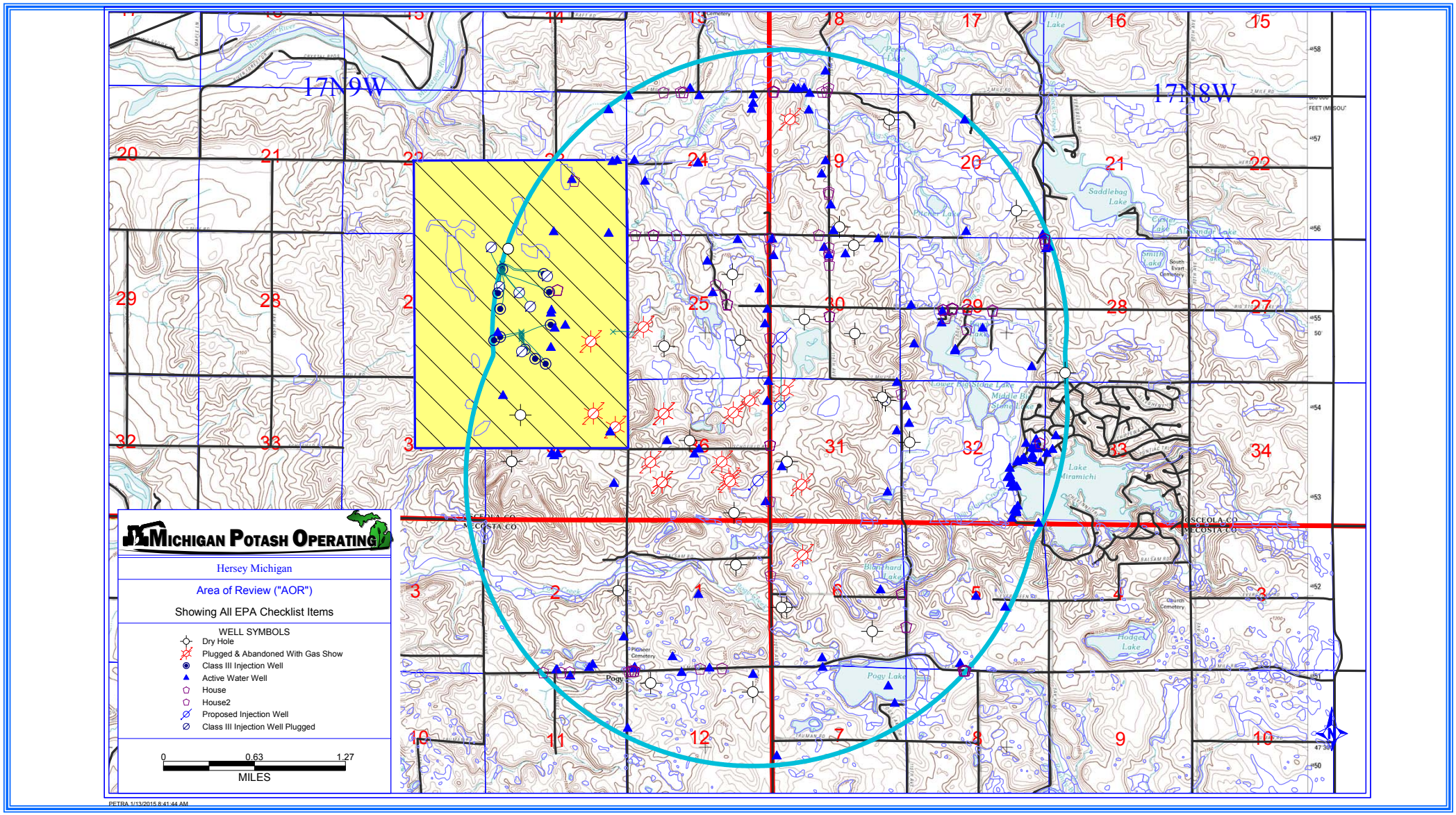

Figure B8. Composite map showing all EPA checklist items, including roads (black) and Area Permit No. MI-133-3G-A0002.

MICHIGAN POTASH OPERATING, LLC

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT C: CORRECTIVE ACTION PLAN AND WELL DATA

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHEMENT C.
CORRECTION ACTION PLAND AND WELL DATA

EPA instruction, form 7520-6 (2011):

CORRECTIVE ACTION PLAN AND WELL DATA –Submit a tabulation of data reasonably available from public records or otherwise known to the applicant on all wells within the area of review, including those on the map required in B, which penetrate the proposed injection zone. Such data shall include the following:

For Class I NON HAZARDOUS A description of each well's types, construction, date, drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require. In the case of new injection wells, include the corrective action proposed to be taken by the applicant under 40 CFR 144.55.Well Data

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C.1 Tabulation of Well Data for all Producing Wells

Records of oil and gas producing wells the state of Michigan are maintained by the MDEQ Division of Oil and Gas and Minerals and the Geological Survey Division. Well permits, completions, and plugging records filed with this agency are organized by county, township, range, and section number.

Active producing oil and gas wells are as follows:

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-36	21-133-36033-00-00	36033	GREIN ET AL 2-36	8141	CABOT HEAD	Aug-83	ACTIVE	NATURAL GAS WELL	43.82640	-85.33910	Mccool John E
17N-9W-35	21-133-36186-00-00	36186	PAINE 1-35	8309	CINCINNATIAN	Dec-82	ACTIVE	NATURAL GAS WELL	43.82740	-85.35080	Mccool John E
17N-9W-26	21-133-37317-00-00	37317	PAINE 1-26	8095	CABOT HEAD	Feb-84	ACTIVE	NATURAL GAS WELL	43.83360	-85.34620	Mccool John E

Cross Reference with **Figure B1,** which shows all producing wells in relation to the proposed injection locations.

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C.2 Tabulation of Well Data for all Active Class I NON HAZARDOUS Injection Wells

Within the AOR, there are two qualifying classes of injection well: Class I NON HAZARDOUS and Class III. They are listed here separately for ease of reference. Records of injection wells are maintained by the US EPA and the state of Michigan MDEQ Division of Oil and Gas and the Geological Survey Division. Well permits, completions, and plugging records filed with this agency are organized by county, township, range, and section number.

Active Class I, Non Hazardous Injection Wells are as follows:

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-26	21-133-00349-70-00	349	WOODWARD 1-26	8140	A-1 SALT	Oct-83	ACTIVE	PART 625, CLASS I NON HAZARDOUS	43.83460	-85.35680	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00350-70-00	350	THOMAS 1-26	8091	A-1 SALT	Jan-84	ACTIVE	PART 625, CLASS I NON HAZARDOUS	43.84180	-85.36110	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC

Cross Reference **Figure B2** shows active Class I NON-HAZARDOUS Injection Wells; the Thomas 1-26 (NW4NW4 Section 26) and the Woodward 1-26 (NE4SW4 Section 26), both operating by Mosaic Hersey Potash, LLC.

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C.3 Tabulation of Well Data for all Active Class III Injection Wells

Within the AOR, there are two qualifying classes of injection well: Class I NON HAZARDOUS and Class III NON HAZARDOUS. This section lists here Class III wells only for ease of reference. Records of injection wells are maintained by the US EPA and the state of Michigan MDEQ Division of Oil and Gas and the Geological Survey Division. Well permits, completions, and plugging records filed with this agency are organized by county, township, range, and section number.

Active Class III, Part 625 Injection Wells are as follows:

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-26	21-133-00449-70-00	449	KALIUM HERSEY 2042	UNK	A-1 SALT	Jun-00	ACTIVE	PART 625, CLASS III	43.83310	-85.35910	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00474-70-00	474	I M C POTASH HERSEY 1061	UNK	A-1 SALT	Jan-02	ACTIVE	PART 625, CLASS III	43.83910	-85.36170	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00384-70-00	384	KALIUM 2061	8066	A-1 SALT	May-85	ACTIVE	PART 625, CLASS III	43.83290	-85.35920	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00391-70-00	391	KALIUM HERSEY 1044	8052	A-1 SALT	Nov-93	ACTIVE	PART 625, CLASS III	43.83950	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00397-70-00	397	KALIUM HERSEY 1032	8018	A-1 SALT	Nov-94	ACTIVE	PART 625, CLASS III	43.83930	-85.36180	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00383-70-00	383	KALIUM 2031	8010	A-1 SALT	Mar-85	ACTIVE	PART 625, CLASS III	43.83330	-85.35920	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00366-70-00	366	KALIUM 1041	7951	A-1 EVAPORITE	May-90	ACTIVE	PART 625, CLASS III	43.84020	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00409-70-00	409	KALIUM HERSEY 2062	7950	A-1 SALT	Aug-96	ACTIVE	PART 625, CLASS III	43.83300	-85.35920	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00380-70-00	380	KALIUM 1051	7890	A-1 SALT	May-85	ACTIVE	PART 625, CLASS III	43.83990	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00387-70-00	387	KALIUM HERSEY 1054	7876	A-1 SALT	Aug-93	ACTIVE	PART 625, CLASS III	43.83980	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00403-70-00	403	KALIUM HERSEY 1014	7865	A-1 SALT	Jul-95	ACTIVE	PART 625, CLASS III	43.83920	-85.36180	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00438-70-00	438	KALIUM HERSEY 2082	7812	A-1 SALT	Jun-07	ACTIVE	PART 625, CLASS III	43.83270	-85.35920	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00408-70-00	408	KALIUM HERSEY 2032	7810	A-1 SALT	Jul-96	ACTIVE	PART 625, CLASS III	43.83340	-85.35920	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00385-70-00	385	KALIUM HERSEY 1013	7595	A-1 SALT	May-92	ACTIVE	PART 625, CLASS III	43.83960	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00347-70-00	347	KALIUM 1012	7285	A-1 EVAPORITE	Jan-85	ACTIVE	PART 625, CLASS III	43.84050	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC

Figure B3 shows all established Class III *AREA* Injection Permit No. MI-133-3G-A0002 (Yellow Cross Hatch) and Active and Inactive Class III Injection Wells. The AOR has undergone extensive prior regulatory review provided the pre-established injection activity within the AOR.

C.4 Tabulation of Well Data for all Abandoned Wells, Plugged Wells, and Dry Holes

Records of abandoned wells, plugged wells, and dry holes in the state of Michigan are maintained by the MDEQ and the Geological Survey Division. Well permits, completions, and plugging records filed with this agency are maintained by county, township, range, and section number. Locations of wells were searched in the following AOR sections:

The following is a list of wells found within or near to the AOR.

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-36	21-133-3611-00-000	36110	THOMPSON 3-36	8366	CINCINNATIAN	Oct-82	INACTIVE	NATURAL GAS WELL	43.82030	-85.33110	Marathon Oil Co.
17N-9W-36	21-133-36068-00-00	36068	BABCOCK ET AL 1-36	8200	CABOT HEAD	Sep-83	INACTIVE	NATURAL GAS WELL	43.82650	-85.32720	Marathon Oil Co.
17N-9W-36	21-133-36925-00-00	36925	BALDINO 1-36	8200	CABOT HEAD	Sep-83	INACTIVE	NATURAL GAS WELL	43.82030	-85.34100	Marathon Oil Company
17N-9W-36	21-133-36991-00-00	36991	HODGES ET AL 1-36	8198	CLINTON	Oct-83	INACTIVE	DRY HOLE	43.81520	-85.32940	Marathon Oil Co.
17N-9W-36	21-133-26888-00-00	26888	GREIN, DONALD 1	1649	BROWN LIMESTONE	Aug-67	INACTIVE	DRY HOLE	43.82250	-85.33560	Consumers Energy Company
17N-9W-36	21-133-31089-00-00	31089	THOMPSON, DON; HODGES, FRANK; SMITH, RALPH 2-36	1616	MICHIGAN STRAY	Jul-76	INACTIVE	NATURAL GAS WELL	43.81860	-85.33010	Mutch Harry L
17N-9W-36	21-133-30537-00-00	30537	THOMPSON, DON; HODGES, FRANK; SMITH, RALPH 1-36	1602	MARSHALL	Nov-75	INACTIVE	NATURAL GAS WELL	43.81830	-85.32990	Mutch Harry L
17N-9W-36	21-133-2871-00-000	28710	THOMPSON & RANDOLPH 1	1586	MICHIGAN STRAY	Dec-71	INACTIVE	NATURAL GAS WELL	43.81820	-85.33940	Mutch Harry L
17N-9W-36	21-133-28710-01-00	28710	THOMPSON & RANDOLPH 1	1586	MICHIGAN STRAY	Dec-71	INACTIVE	NATURAL GAS WELL	43.81820	-85.33940	Mutch Harry L
17N-9W-36	21-133-28498-01-00	28498	GREIN, DONALD 1	1539	MICHIGAN STRAY	Aug-71	INACTIVE	NATURAL GAS WELL	43.82520	-85.33920	Hersey Oil and Gas Co.
17N-9W-36	21-133-28498-00-00	28498	GREIN, DONALD 1	1526	MICHIGAN STRAY	Aug-71	INACTIVE	NATURAL GAS WELL	43.82520	-85.33920	Hersey Oil and Gas Co.
17N-9W-36	21-133-28365-00-00	28365	THOMPSON, EDITH 1	1518	MICHIGAN STRAY	Jun-71	INACTIVE	NATURAL GAS WELL	43.82530	-85.32950	Mutch Harry L
17N-9W-35	21-133-36627-00-00	36627	STATE HERSEY 1-35			Apr-83	INACTIVE	LOCATION	43.81670	-85.35090	Rovsek Aldolph E and Muskegon Development Company
17N-9W-35	21-133-36355-00-00	36355	STATE HERSEY 2-35	8310	CINCINNATIAN	Jan-83	INACTIVE	DRY HOLE	43.82030	-85.36040	Marathon Oil Co.
17N-9W-35	21-133-38748-00-00	38748	GREIN 1-35	8206	CABOT HEAD	Jun-85	INACTIVE	NATURAL GAS WELL	43.82380	-85.34600	Marathon Oil
17N-9W-35	21-133-28888-00-00	28888	RANDOLPH & PAINE & THIEL UNIT 1	1655	MICHIGAN STRAY	Jul-72	INACTIVE	DRY HOLE	43.82500	-85.35920	Mutch J O
17N-9W-35	21-133-28786-00-00	28786	GREIN, DONALD & PAINE, HENRY 1	1638	MICHIGAN STRAY	Mar-72	INACTIVE	NATURAL GAS WELL	43.82510	-85.34900	Hersey Oil and Gas Co.
17N-9W-26	21-133-37519-00-00	37519	MILLER 1-25	8425	CABOT HEAD	Aug-84	INACTIVE	NATURAL GAS WELL	43.83340	-85.34630	Marathon Oil Co.
17N-9W-26	21-133-36942-00-00	36942	WOODWARD ET AL 1-26	8135	CABOT HEAD	Oct-83	INACTIVE	DRY HOLE	43.83460	-85.35680	PPG Oil and Gas Company, Inc.
17N-9W-26	21-133-00378-70-00	378	KALIUM 1042	8116	A-1 SALT	Feb-85	INACTIVE	PART 625, CLASS III	43.84010	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-366-00-0000	36600	THOMAS 1-26	8085	CABOT HEAD	Jan-84	INACTIVE	DRY HOLE	43.84180	-85.36110	PPG Oil and Gas Company, Inc.

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
17N-9W-26	21-133-00379-70-00	379	KALIUM 1052	8045	A-1 SALT	Mar-85	INACTIVE	PART 625, CLASS III	43.83980	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00394-70-00	394	KALIUM HERSEY 1031	7973	A-1 SALT	Oct-94	INACTIVE	PART 625, CLASS III	43.83940	-85.36180	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00448-70-00	448	KALIUM HERSEY 2041	7941	A-1 SALT	Jun-00	INACTIVE	PART 625, CLASS III	43.83320	-85.35910	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00348-70-00	348	KALIUM 1011	7827	A-1 EVAPORITE	Nov-84	INACTIVE	PART 625, CLASS III	43.84050	-85.36150	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00437-70-00	437	KALIUM HERSEY 2081	7811	A-1 SALT	Jun-07	INACTIVE	PART 625, CLASS III	43.83270	-85.35920	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-00381-70-00	381	KALIUM 1031	4800	A-1 SALT	Feb-92	INACTIVE	PART 625, CLASS III	43.83960	-85.36190	Mosaic USA LLC, DBA Mosaic Potash Hersey, LLC
17N-9W-26	21-133-28635-00-00	28635	PAINE, HENRY 1	1558	MICHIGAN STRAY	Nov-71	INACTIVE	NATURAL GAS WELL	43.83240	-85.34940	Mutch Harry L
17N-9W-25	21-133-30341-00-00	30341	MILLER, DOUGLAS & THIEL, HAULDAH 1-25	1561	BROWN LIMESTONE	Aug-75	INACTIVE	DRY HOLE	43.83190	-85.33920	Mutch Harry L
17N-9W-25	21-133-30384-00-00	30384	JOHNSON, WALT & MILLER, DOUG & THIEL, H 1-25	1529	MICHIGAN STRAY	Aug-75	INACTIVE	DRY HOLE	43.83260	-85.32860	Mutch J O
17N-9W-25	21-133-12066-00-00	12066	JOHNSON-CODY ET AL COMM. 1	1520	MARSHALL	Jan-46	INACTIVE	DRY HOLE	43.83920	-85.32970	Oryx Energy Co. and Carter Oil Co.
17N-8W-32	21-133-27307-00-00	27307	MANEY, NORMAN 1	1660	MARSHALL	Jul-68	INACTIVE	DRY HOLE	43.82230	-85.30490	Consumer Power and Michigan Consolidated Gas
17N-8W-31	21-133-34558-00-00	34558	FREUDENBURG 1-31	10858	PRAIRIE DU CHIEN	Jul-81	INACTIVE	DRY HOLE	43.82650	-85.30830	JEM Petroleum Corp.
17N-8W-31	21-133-358-00-0000	35800	GRAY 1-31	9769	PRAIRIE DU CHIEN	Aug-82	INACTIVE	NATURAL GAS WELL	43.82750	-85.32240	Marathon Oil Co.
17N-8W-31	21-133-36336-00-00	36336	PARK 1-31	8216	CLINTON	Feb-84	INACTIVE	DRY HOLE	43.82030	-85.32200	Marathon Oil Co.
17N-8W-31	21-133-34558-01-00	34852	FREUDENBURG 1-31A	8183	DUNDEE	Aug-81	INACTIVE	DRY HOLE	43.82650	-85.30830	JEM Petroleum Corp.
17N-8W-31	21-133-31786-00-00	31786	KNAPP, GERALD & PARKS, ROBERT 1-31	1590	MICHIGAN STRAY	Sep-77	INACTIVE	NATURAL GAS WELL	43.81800	-85.32000	Hersey Oil and Gas Co.
17N-8W-30	21-133-35977-00-00	35977	WARK 1-30	8371	CINCINNATIAN	Sep-82	INACTIVE	DRY HOLE	43.84210	-85.31280	Willmet Inc.
17N-8W-30	21-133-33466-00-00	33466	MANEY, NORMAN 1-30	5080	AMHERSTBURG	Feb-80	INACTIVE	DRY HOLE	43.83470	-85.31960	Dart Oil and Gas Co.
17N-8W-30	21-133-27159-00-00	27159	MADDERN, H 1	4030	DUNDEE	Feb-68	INACTIVE	DRY HOLE	43.83330	-85.31260	Madlou Inc.
17N-8W-19	21-133-38463-00-00	38463	VUKIN UNIT 1-19	8385	CINCINNATIAN	Feb-85	INACTIVE	DRY HOLE	43.84400	-85.31480	PPG Oil and Gas Company, Inc. and Amoco Production Co.
17N-8W-19	21-133-38463-70-00	5006	VUKIN UNIT 1-19	8385		Dec-84	INACTIVE	DRY HOLE	43.84400	-85.31480	PPG Oil and Gas Company, Inc. and Amoco Production Co.
16N-9W-2	21-107-37188-00-00	37188	JENSEN 1-2	8085	CABOT HEAD	Nov-83	INACTIVE	DRY HOLE	43.80730	-85.34550	Marathon Oil Co.
16N-9W-12	21-107-00340-70-00	340	PILARSKI 1-12	8318	CINCINNATIAN	Aug-84	INACTIVE	DRY HOLE	43.79740	-85.32660	PPG Industries, Inc.
16N-9W-12	21-107-36283-00-00	36283	PARK 1-12	8215	CINCINNATIAN	Jan-83	INACTIVE	DRY HOLE	43.79800	-85.34090	Willmet Inc.
16N-9W-11	21-107-00339-70-00	339	WARD 1-11	8121	CINCINNATIAN	Aug-84	INACTIVE	DRY HOLE	43.79010	-85.34660	PPG Industries, Inc.

TRS	API Number	Permit Number	Well Name and Number	Total Depth	Formation at Total Depth	Drill Date	Well Status	Well Type	WH_Lat	WH_Long	Operator Name
16N-9W-11	21-107-36864-00-00	36864	WARD 1-11	8121	CINCINNATIAN	Sep-83	INACTIVE	DRY HOLE	43.79010	-85.34660	PPG Industries, Inc.
16N-9W-1	21-107-00377-70-00	377	JOHNSON 2-1	8085	A-1 SALT	Apr-84	INACTIVE	DRY HOLE	43.80980	-85.32910	PPG Industries, Inc.
16N-9W-1	21-107-00337-70-00	337	JOHNSON 3-1	8073	A-1 EVAPORITE	May-84	INACTIVE	DRY HOLE	43.80980	-85.32900	PPG Industries, Inc.
16N-8W-7	21-107-36187-00-00	36187	STEIN 1-7	8380	CINCINNATIAN	Nov-82	INACTIVE	DRY HOLE	43.79110	-85.31200	Willmet Inc.
16N-8W-6	21-107-36067-00-00	36067	JOHNSON ET AL 1-6	8386	CINCINNATIAN	Oct-82	INACTIVE	DRY HOLE	43.80570	-85.32200	Marathon Oil Co.
16N-8W-6	21-107-30728-00-00	30728	MCLACHLAN, GEORGE 1-6	1670	MICHIGAN STRAY	May-76	INACTIVE	DRY HOLE	43.80330	-85.31010	Mutch Harry L
16N-8W-6	21-107-30654-00-00	30654	KNAPP, GERALD & JOHNSON, DON 1-6	1610	MICHIGAN STRAY	Dec-75	INACTIVE	NATURAL GAS WELL	43.81090	-85.31980	Mutch Harry L
16N-8W-18	21-107-3689-00-000	36890	STEIN 1-18	8264	CINCINNATIAN	Aug-83	INACTIVE	DRY HOLE	43.77650	-85.30740	PPG Oil and Gas Company, Inc.

Figure B4 shows all plugged wells, shallow or deep within the area of review. Total depths of the each well is listed next to its well symbol. Also shown on this map are the API Serial number. The serial number is illustrated below:

State	–	County	–	**Serial**	–	Completion
21	-	133	-	#####	-	00-00

Mineral wells available to the public record or made known to the applicant are also shown. These wells are preceded with the letter "M" before the listed Serial No. The State of Michigan has adapted a 'pseudo API No,' utilizing the mineral permit number as an API Serial No. As an example; M4999 would have the equivalent Mineral Well API designation of :

State	–	County	–	**Serial**	–	Completion
21	-	133	-	0**4999**	-	**70**-00

These numbers can be quickly cross referenced with public records, and or the tabular section above.

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C.5 Tabulation of Well Date for the Location of all Water Wells of Public Record or otherwise known to the Applicant within the AOR or within a quarter mile of the Facility Property Boundary, whichever is greater

The area of investigation radius of 2 miles is greater than the quarter mile boundary from the proposed facility property boundary. Therefore a list of all Water Wells within the Area of Review have been cataloged and presented here.

Water well records for the State of Michigan are maintained by the MDEQ. The filing system used is referenced by section, township, and range. In 2003, The Michigan Groundwater Mapping Project was mandated by Public Act 148 of 2003, which requires that a groundwater inventory and map be generated for the state. Funding was provided by the State of Michigan through cooperative agreement with the U.S. Geological Survey (USGS) and the MSU Institute of Water Research. A comprehensive list of wells and pump test data has been carefully cataloged via this effort. http://gwmap.rsgis.msu.edu//.

A total of 177 freshwater wells are located in the AOR. The deepest well is 400 feet deep and is operated by Mosaic Hersey Potash, LLC. The shallowest well is 30 feet deep.

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C.5 Tabulation of Well Data for the Location of all Water Wells of Public Record or otherwise known to the Applicant within the AOR or within a quarter mile of the Facility Property Boundary, whichever is greater

TRS	Well/Permit Number	Owner Name	Well Number	Total Depth	Build Date	Surf Lat	Surf Lon	Well Type	Scrn Top	Scrn Btm
17N-09W-36	67000000759	BABCOCK, JIM		39	Sep-70	43.826378	-85.324801	HOSHLD	35	39
17N-09W-36	67000000760	HODGES, FRANK		108	May-71	43.81627	-85.324972	HOSHLD	100	108
17N-09W-36	67000006030	MARY BRININSTOOL	06-083	144	Oct-06	43.821049	-85.334937	HOSHLD	138	144
17N-09W-36	67000006107	SAM SIMMON	06-302	106	Dec-06	43.821551	-85.334289	HOSHLD	101	106
17N-09W-36	67000006806	Elvis Peacock	11-050	215	Jul-11	43.828389	-85.324637	HOSHLD	211	215
17N-09W-36	67000007021	ROY HENDERSON	45	215	May-11	43.822379	-85.338747	HOSHLD	205	215
17N-09W-35	67000000754	EICHENBERG, JIM		158	Jul-85	43.818069	-85.346128	HOSHLD	154	158
17N-09W-35	67000000756	WING, ROCKNEY L.		145	Jul-90	43.820844	-85.35446	HOSHLD	140	145
17N-09W-35	67000000757	LES JOHNSON		181	Jun-96	43.826884	-85.361609	HOSHLD	176	181
17N-09W-35	67000004798	JOIE LAFEVE	03-335	165	Oct-03	43.823257	-85.34666	HOSHLD	160	165
17N-09W-35	67000005237	WILLIAM J BOHLEN	1278	143	Sep-01	43.823257	-85.34666	HOSHLD	138	143
17N-09W-35	67000005557	ROCKNEY L WING SR	05-155	162	Jun-05	43.821033	-85.353961	HOSHLD	157	162
17N-09W-35	67000006302	TRENTON & TAMMY LIVEMORE	07-092	183	Aug-07	43.821059	-85.354797	HOSHLD	178	183
17N-09W-34	67000000752	SOUTH PARK HOMES		186	Oct-84	43.828359	-85.380057	HOSHLD	180	186
17N-09W-34	67000000753	P.P.G/		310	May-84	43.827517	-85.381758	HOSHLD	300	310
17N-09W-34	67000004143	LEWIS DELINE JR.	02-308	335	Sep-02	43.828734	-85.373524	HOSHLD	330	335
17N-09W-34	67000004443	LEWIS DELINE JR.	02-308	335	Sep-02	43.826976	-85.376415	HOSHLD	330	335
17N-09W-34	67000004761	JOIE LEFAVE	03-335	165	Oct-03	43.823346	-85.366554	HOSHLD	160	165
17N-09W-34	67000006380	Scott Stieg	07-250	345	May-08	43.82847	-85.371566	HOSHLD	340	345
17N-09W-33	67000000749	STRAATHOF, ED		186	Aug-89	43.828116	-85.387674	HOSHLD	182	186
17N-09W-28	67000005854	JEFF NICKLAS	06-011	207	May-06	43.830576	-85.386339	HOSHLD	202	207
17N-09W-27	67000000661	STEINHOFF, HELEN		213	May-80	43.828979	-85.372756	HOSHLD	209	213
17N-09W-27	67000000662	DAILEY, MARTIN		95	Sep-89	43.837604	-85.364486	HOSHLD	91	95
17N-09W-26	67000000655	PPG INDUSTRIES, INC.		380	Apr-85	43.840106	-85.363162	UNK	247	330
17N-09W-26	67000000656	KALIUM CHEMICALS		285	Jan-85	43.840001	-85.362658	TY2PU	277	285
17N-09W-26	67000000659	KALIUM CHEMICALS		105	Dec-95	43.835502	-85.354887	OTH	100	105
17N-09W-26	67000000660	KALIUM CHEMICALS		344	Dec-96	43.833669	-85.354436	TY2PU	322	344
17N-09W-26	67000003720	I.M.C. KALIUM	00-0042	400	Jan-00	43.831741	-85.354957	OTH	340	400
17N-09W-26	67000006333	KALIUM CHEMICALS		317		43.835202	-85.354984	TY2PU	302	317

TRS	Well/Permit Number	Owner Name	Well Number	Total Depth	Build Date	Surf Lat	Surf Lon	Well Type	Scrn Top	Scrn Btm
17N-09W-26	67000006966	KALIUM CHEMICALS	98-05-0153	295	May-98	43.83323	-85.362373	TY2PU	288	295
17N-09W-26	67000006967	KALIUM CHEMICALS	99-0076	104	May-99	43.833979	-85.352973	TY2PU	100	105
17N-09W-25	67000000649	JOHNSON, ROBERT		56	Apr-68	43.837696	-85.325921	HOSHLD	52	56
17N-09W-25	67000000650	MENEZES, MARCO		57	Aug-84	43.840485	-85.333201	HOSHLD	53	57
17N-09W-25	67000000651	FORD, KEN		40	Aug-78	43.834171	-85.325142	HOSHLD	36	40
17N-09W-25	67000000652	REICHOW, DEAN		58	Dec-82	43.83564	-85.324828	HOSHLD	54	58
17N-09W-25	67000000653	WALKER, JACOB		102	Nov-77	43.842655	-85.328976	HOSHLD	98	102
17N-09W-25	67000006424	MATTHEW & MAGGIE WALCOTT	07-249	139	Oct-07	43.837309	-85.332417	HOSHLD	134	139
17N-09W-24	67000004881	JEANNETTE HECTOR	04-094	37	May-04	43.850361	-85.334528	HOSHLD	30	37
17N-09W-24	67000005227	DIAMOND CONSTRUCTION	1335	105	Dec-01	43.848514	-85.341912	HOSHLD	100	105
17N-09W-24	67000006358	JAMES R MOORE	07-280	55	Nov-07	43.850361	-85.334528	HOSHLD	50	55
17N-09W-23	67000000642	REED, ART		48	Sep-81	43.843388	-85.35462	HOSHLD	43	48
17N-09W-23	67000000643	GINDER, MARTIN		58	Aug-73	43.843256	-85.34696	HOSHLD	54	58
17N-09W-22	67000006180	STEPHANIE STRAATHOF	06-048	40	May-07	43.84426	-85.365276	HOSHLD	35	40
17N-08W-33	67000000405	MIRAMICHI UTILITIES INC		0		43.828096	-85.278347	TY1PU	0	0
17N-08W-33	67000003913	LLOYD & GLORIA JENKINS	02-080	175	May-02	43.822158	-85.277385	HOSHLD	165	175
17N-08W-33	67000003937	ETHEL B WRIGHT	02-110	57	May-02	43.815771	-85.282351	HOSHLD	47	57
17N-08W-33	67000003977	STEVEN KAHLER	2036	250	Mar-02	43.822981	-85.28456	HOSHLD	240	250
17N-08W-33	67000003979	CYRIL WORTH	2048	121	Mar-02	43.821217	-85.278466	HOSHLD	113	121
17N-08W-33	67000003982	RICHARD HALIFAX	2055	129	Mar-02	43.823108	-85.281776	HOSHLD	119	129
17N-08W-33	67000003985	ROBERT BALLARD	2043	136	Mar-02	43.821204	-85.285833	HOSHLD	128	136
17N-08W-33	67000004001	ROBERT BEVIER	02-132	172	May-02	43.824086	-85.277911	HOSHLD	167	172
17N-08W-33	67000004013	RONALD F NEAL	00-0100	100	Mar-02	43.816497	-85.28344	HEATP	95	100
17N-08W-33	67000004016	JACK BRIGGS	02-079	100	Apr-02	43.815487	-85.281797	HOSHLD	95	100
17N-08W-33	67000004023	HOWARD DALLEY	02-042	145	Apr-02	43.825625	-85.282619	HOSHLD	140	145
17N-08W-33	67000004036	RANDALL AVERY	02-353	136	Oct-02	43.823069	-85.28116	HOSHLD	128	136
17N-08W-33	67000004037	RANDALL AVERY	02-413	185	Oct-02	43.821341	-85.278718	HOSHLD	177	185
17N-08W-33	67000004151	EDWARD P. DETMET	02-461	176	Dec-02	43.822691	-85.280439	HOSHLD	171	176
17N-08W-33	67000004193	RICHARD MANN	02-381	110	Oct-02	43.815696	-85.281947	HOSHLD	105	110
17N-08W-33	67000004242	JON & MARY NELSON	02-135	47	May-02	43.815233	-85.280892	HOSHLD	37	47
17N-08W-33	67000004243	JERRY & LEANNA VONDERHARR	02-081	167	May-02	43.820924	-85.278052	HOSHLD	157	167
17N-08W-33	67000004273	ORION J GRAEY	2108	133	Jul-02	43.816494	-85.28298	HOSHLD	128	133
17N-08W-33	67000004277	WILLIAM HAMILTON	2139	141	Jul-02	43.825394	-85.280944	HOSHLD	136	141
17N-08W-33	67000004280	HEATHER ROBERTS	2131	126	Jul-	43.827875	-	HOSHLD	121	126

TRS	Well/Permit Number	Owner Name	Well Number	Total Depth	Build Date	Surf Lat	Surf Lon	Well Type	Scrn Top	Scrn Btm
					02		85.281922			
17N-08W-33	67000004302	Daniel Ferguson	2205	133	Jul-02	43.816629	-85.283346	HOSHLD	128	133
17N-08W-33	67000004332	AUDREA KUHFELDT	02-173	126	Aug-02	43.815009	-85.279872	HOSHLD	121	126
17N-08W-33	67000004343	REGINALD AND DONNA SEXTON	2199	101	Jun-02	43.815076	-85.279963	HOSHLD	96	101
17N-08W-33	67000004349	DENNIS BRYANT	02-065	248	Aug-02	43.821611	-85.285031	HOSHLD	243	248
17N-08W-33	67000004358	GEORGE & SUE HOLLINGSHEAD	02-409	140	Sep-02	43.822412	-85.279854	HOSHLD	135	140
17N-08W-33	67000004364	LINDA C RAGNOLI	2181	175	May-02	43.828148	-85.280301	HOSHLD	170	175
17N-08W-33	67000004366	RICHARD B FELCYN	2258	129	Jul-02	43.82297	-85.281892	HOSHLD	124	129
17N-08W-33	67000004367	JOHN STENCEL AND CELESTE HINKL	2177	176	Jul-02	43.823391	-85.278427	HOSHLD	171	176
17N-08W-33	67000004375	PRICELLA KILPARTICK	02-219	174	May-02	43.825243	-85.280336	HOSHLD	169	174
17N-08W-33	67000004393	ARTHUR ELIASON	03-415	174	May-03	43.822178	-85.279546	HOSHLD	166	174
17N-08W-33	67000004472	MARTY & JEANNE HUNTER	03-178	111	Jun-03	43.814417	-85.27935	HOSHLD	106	111
17N-08W-33	67000006381	Judy Wynia	07-185	115	Mar-08	43.815258	-85.282049	HOSHLD	105	115
17N-08W-32	67000000404	SILER, KENNETH		30	Aug-72	43.824187	-85.305014	HOSHLD	26	30
17N-08W-32	67000003881	RAY WELSH	02-082	190	Apr-02	43.820534	-85.289268	HOSHLD	180	190
17N-08W-32	67000003887	MATTHEW V KLINE	02-067	260	Apr-02	43.820282	-85.286736	HOSHLD	250	260
17N-08W-32	67000003889	DOUG DORN	02-051	232	Apr-02	43.815895	-85.289838	HOSHLD	222	232
17N-08W-32	67000003917	RHONDA RUPP	02-161	136	May-02	43.82034	-85.289977	HOSHLD	126	136
17N-08W-32	67000003926	GIUSEPPE N MASCIA	02-045	92	May-02	43.820465	-85.289835	HOSHLD	82	92
17N-08W-32	67000003938	JOANN C MILLER	02-095	260	May-02	43.819707	-85.290986	HOSHLD	250	260
17N-08W-32	67000003975	JOANN C MILLER	02-095	260	Aug-02	43.819707	-85.290986	HOSHLD	255	260
17N-08W-32	67000003980	STEVEN KAHLER	2037	280	Mar-02	43.822202	-85.288724	HOSHLD	270	280
17N-08W-32	67000003981	CLYDE HICKS	2041	133	Mar-02	43.818976	-85.290918	HOSHLD	125	133
17N-08W-32	67000003983	BRIAN BRENNAN	2039	89	Mar-02	43.81524	-85.290017	HOSHLD	83	89
17N-08W-32	67000003984	ISABELLE MARDEN	2058	133	Mar-02	43.818426	-85.290664	HOSHLD	126	133
17N-08W-32	67000003986	CHARLES BAUMAN	2044	235	Mar-02	43.81784	-85.289997	HOSHLD	228	235
17N-08W-32	67000003999	DAVID & NANCY KITCHEN	02-047	242	Apr-02	43.818171	-85.290841	HOSHLD	237	242
17N-08W-32	67000004000	JACK & LOIS CALLIHAN	02-154	111	May-02	43.81875	-85.291283	HOSHLD	106	111
17N-08W-32	67000004028	DON AND KARALYNNE BURNS	2038	285	Apr-02	43.821749	-85.287929	HOSHLD	280	285
17N-08W-32	67000004081	EDDIE AND CAROLE ZELINSKI	02-453	238	Oct-02	43.820683	-85.28779	HOSHLD	233	238
17N-08W-32	67000004120	DANIEL L. AND LORETTA DAVID	02-476	263	Nov-02	43.821673	-85.287575	HOSHLD	258	263
17N-08W-32	67000004152	GARY LEYENDECKER	02-033	112	Nov-02	43.815484	-85.290338	HOSHLD	107	112
17N-08W-32	67000004192	ELLEN MCCAULEY	02-410	242	Oct-02	43.820747	-85.289019	HOSHLD	237	242
17N-08W-32	67000004206	DON AND KARALYNNE BURNS	2038	285	Apr-02	43.821648	-85.287056	HOSHLD	280	285
17N-08W-32	67000004214	DELBERT A. SARGENT	02-113	116	Oct-	43.81534	-	HOSHLD	111	116

					02		85.290076			
17N-08W-32	67000004233	JAMES L. MARKLEVITZ	02-090	245	Apr-02	43.82049	-85.289314	HOSHLD	225	245
17N-08W-32	67000004239	PAUL NEUMANN	02-078	263	Apr-02	43.821753	-85.287181	HOSHLD	253	263
17N-08W-32	67000004272	JOHN CORACE	2248	219	Jul-02	43.817799	-85.290564	HOSHLD	214	219
17N-08W-32	67000004306	JOE AND MYRA VERMEULEN	2091	132	Apr-02	43.814678	-85.290652	HOSHLD	112	132
17N-08W-32	67000004347	FRED & PAT CHLUBISKI	02-373	247	Sep-02	43.81554	-85.290073	HOSHLD	242	247
17N-08W-32	67000004479	E B BROWSKI	03-203	238	Jun-03	43.82047	-85.289061	HOSHLD	233	238
17N-08W-32	67000004840	FRED V. & JOYCE PANKOW	02-370	154	Sep-02	43.822632	-85.287303	HOSHLD	149	154
17N-08W-32	67000006029	DAVE & WENDY	05-207	248	Jun-06	43.821028	-85.287819	HOSHLD	243	248
17N-08W-32	67000006609	KENNETH POSTEMA & TRUST	08-216	150	Nov-08	43.825919	-85.305398	HOSHLD	145	150
17N-08W-31	67000000402	BAILEY, BRUCE		56	Jul-86	43.817269	-85.307998	HOSHLD	51.5	55.5
17N-08W-31	67000000403	BAILEY, GEORGE		133	Jun-95	43.82344	-85.306735	HOSHLD	129	133
17N-08W-31	67000004922	RONALD FREUDENBURG	04-105	50	May-04	43.828319	-85.306742	HOSHLD	40	50
17N-08W-31	67000005469	SCOTT E HENRY	01-235	196	Dec-01	43.819797	-85.322747	HOSHLD	191	196
17N-08W-30	67000000399	ELDER, BRIAN		40	Aug-82	43.842777	-85.309368	HOSHLD	36	40
17N-08W-30	67000000400	EVANS, DAVID		140	Aug-80	43.841891	-85.316928	HOSHLD	136	140
17N-08W-30	67000000401	ERBIN, CASS		150	Aug-93	43.842724	-85.324147	HOSHLD	145	150
17N-08W-30	67000005466	ROBERT DAVEY	01-215	121	Jun-01	43.841252	-85.313951	HOSHLD	116	121
17N-08W-30	67000005468	CHARLES T SMITH	02-059	170	Apr-02	43.841139	-85.316286	HOSHLD	160	170
17N-08W-30	67000006622	Burwell Mackall	09-131	39	Nov-09	43.841049	-85.323967	HOSHLD	34	39
17N-08W-29	67000000394	DELLAPENNA, AL		31	Aug-86	43.829934	-85.28794	HOSHLD	27	31
17N-08W-29	67000000395	HICKS, BILL		71	Sep-83	43.836089	-85.304778	HOSHLD	67	71
17N-08W-29	67000000396	KREIGER, RONALD		40	Jul-89	43.835502	-85.300414	HOSHLD	36	40
17N-08W-29	67000000397	AYRE, BILL		48	Jul-91	43.831517	-85.298658	HOSHLD	44	48
17N-08W-29	67000000398	MANEY, NORM & EVELYN		54	Aug-90	43.833804	-85.2948	HOSHLD	50	54
17N-08W-29	67000004689	ALAN DELLAPENNCE	3427	62	Oct-03	43.831672	-85.298616	HOSHLD	54	62
17N-08W-29	67000006327	John Buck	08-030	103	May-08	43.834319	-85.300528	HOSHLD	99	103
17N-08W-29	67000006974	R. Kevin Reynolds	JBES8Y2LA3	160	Jul-13	43.832199	-85.304338	HOSHLD	150	160
17N-08W-20	67000000347	JOHNSTON, ROBERT		84	Aug-73	43.843525	-85.297122	HOSHLD	80	84
17N-08W-19	67000000342	KAGE, CYNTHIA		58	May-84	43.850614	-85.316743	HOSHLD	54	58
17N-08W-19	67000000343	VUKIN, NICK		120	Jun-83	43.846172	-85.315999	HOSHLD	116	120
17N-08W-19	67000000344	AMOCO PRODUCTION CO.		50	Dec-84	43.843588	-85.31563	UNK	45	50
17N-08W-19	67000007036	RICK WITKOWSKI	12107	112	Jul-12	43.84928	-85.317287	HOSHLD	107	112
17N-08W-	67000004854	RICHARD OTT	02-300	133	Aug-02	43.811119	-85.284596	HOSHLD	128	133
16N-09W-4	54000004110	JOHN DENNISTON	5404603	76	Oct-04	43.806742	-85.388082	HOSHLD	71	76

TRS	Well/Permit Number	Owner Name	Well Number	Total Depth	Build Date	Surf Lat	Surf Lon	Well Type	Scrn Top	Scrn Btm
16N-09W-3	54000000679	BOYD, J. KENT		88	Aug-71	43.803698	-85.364519	HOSHLD	84	88
16N-09W-3	54000000680	WARD, JAMES		70	Jun-94	43.8018	-85.381897	HOSHLD	66	70
16N-09W-2	54000002042	Charles & Tonya Park	54-2253	152	Jul-01	43.799841	-85.349004	HOSHLD	142	152
16N-09W-2	54000002339	MICHAEL GUILD	54-2034	108	Jan-01	43.799532	-85.349492	HOSHLD	98	108
16N-09W-2	54000003299	CHARLES & TONYA PARK	5403933	163	Sep-03	43.799151	-85.357512	HOSHLD	153	163
16N-09W-2	54000005514	ROBERT & BETTY PARK	5406496	120	Oct-08	43.799278	-85.354097	HOSHLD	110	120
16N-09W-2	54000005676	WILLIAM KEMMENY	5406703	154	Jul-09	43.802618	-85.344687	HOSHLD	147	154
16N-09W-2	54000006031	Toni Parks	5407667	110	Nov-12	43.799292	-85.353963	HOSHLD	100	110
16N-09W-12	54000000715	WALTERS, WILLIAM H.		130	Nov-76	43.799073	-85.336605	HOSHLD	126	130
16N-09W-12	54000000716	PILARSKI, DANIEL		92		43.798884	-85.32666	HOSHLD	88	92
16N-09W-12	54000000717	WARD, ROBERT		104	Sep-75	43.791467	-85.343675	HOSHLD	100	104
16N-09W-12	54000001805	ROBERT WARD	54-2069	125	Nov-00	43.793426	-85.344119	HOSHLD	121	125
16N-09W-11	54000000714	PARKS, WES		69	Jan-75	43.798683	-85.357712	HOSHLD	65	69
16N-09W-11	54000001360	ROBERT PARK	54-1429	127	Nov-99	43.798677	-85.352122	OTH	117	127
16N-09W-11	54000001792	ROGER SCHMIDT	54-1907	135	Nov-00	43.795575	-85.363817	HOSHLD	130	135
16N-09W-10	54000000711	MROZ, ROBERT		96	Jun-77	43.797167	-85.38164	HOSHLD	91	96
16N-09W-10	54000000713	BOYD, J. KENT		83	Oct-69	43.798761	-85.364436	HOSHLD	79	83
16N-09W-10	54000001712	LEO MARTIN	54-2061	149	Oct-00	43.79679	-85.364781	OTH	139	149
16N-09W-1	54000000678	PARK, ROBERT		123	Jun-76	43.799565	-85.343146	HOSHLD	118	123
16N-09W-1	54000001819	TROY & DENISE VANSYCLE	54-1883	165	Nov-00	43.806923	-85.334308	HOSHLD	161	165
16N-09W-1	54000002077	RUTH REED	54-2228	185	Jun-01	43.799514	-85.332729	HOSHLD	180	185
16N-09W-1	54000002734	CALVIN REHFOPF	5403299	110	Dec-02	43.800645	-85.337884	HOSHLD	100	110
16N-09W-1	54000005561	ROBERT & BETTY PARK	5406497	123	Oct-08	43.799428	-85.343267	HOSHLD	116	123
16N-08W-7	54000004642	DEAN FEAR HEILEY	5405371	63	Jun-04	43.797754	-85.307829	HOSHLD	58	63
16N-08W-7	54000005000	CINDY MANEKE	5405756	144	Dec-06	43.799608	-85.316968	HOSHLD	139	144
16N-08W-7	54000005288	LONNIE WALTERS	5406089	78	Sep-07	43.796018	-85.306918	HOSHLD	73	78
16N-08W-6	54000003335	Dan Gray	5402884	196	Jan-04	43.800568	-85.317048	HOSHLD	192	196
16N-08W-6	54000004020	LORRIE BLANCHARD	5404467	143	Oct-04	43.807439	-85.308952	HOSHLD	138	143
16N-08W-5	54000002456	WILLIE HAMILTON	5402945	234	May-02	43.814167	-85.286954	HOSHLD	229	234
16N-08W-5	54000002653	HONORE M MONCION	5403227	122	Oct-02	43.813918	-85.286322	HOSHLD	117	122
16N-08W-5	54000004478	SHIRLEY ROUTHEAUX	5405065	154	Sep-05	43.800041	-85.297827	HOSHLD	149	154
16N-08W-5	54000005270	Leslie Wright	5406144	125	May-08	43.8068	-85.295644	HOSHLD	120	125
16N-08W-5	54000005336	JDJ RANCH REAL ESTATE	5406058	184	Aug-07	43.805718	-85.291599	HOSHLD	174	184
16N-08W-4	54000002471	CHARLES JALOVEC	5402921	126	Jun-02	43.811284	-85.283572	HOSHLD	121	126

16N-08W-4	54000002472	RICHARD MAZIARZ	5403042	248	May-02	43.811138	-85.284623	HOSHLD	243	248
16N-08W-4	54000002473	ROBERT DAREL	5403067	133	Jun-02	43.810373	-85.283636	HOSHLD	128	133
16N-08W-4	54000002476	DANNY VENTRESS	5402989	205	Jun-02	43.811044	-85.281741	HOSHLD	200	205
16N-08W-4	54000002477	EDGAR WELCH	5402958	90	Jun-02	43.810587	-85.281484	HOSHLD	85	90
16N-08W-4	54000002503	Maryanne Lopez	5403371	72	Oct-02	43.810515	-85.282872	HOSHLD	60	70
16N-08W-4	54000002505	LOWRY SNYDER	5403076	130	Aug-02	43.813995	-85.279803	HOSHLD	125	130
16N-08W-4	54000002550	JOE COARACE	5403007	211	Jul-02	43.812127	-85.284873	HOSHLD	191	211
16N-08W-4	54000003008	WILLIAM KLERK	5402955	122	Jun-02	43.815173	-85.280213	HOSHLD	117	122
16N-08W-4	54000003033	STANISLAW BIEL	5402988	154	May-03	43.812966	-85.279621	HOSHLD	149	154
16N-08W-4	54000003896	CHRISTOPHER WYSOCKI	5403789	156	Sep-04	43.812132	-85.283471	HOSHLD	148	156
16N-08W-4	54000004595	ERIN CAUGHEY	5405081	118	Oct-05	43.813248	-85.278918	HOSHLD	113	118

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C.6 Corrective Action Plan for inadequately plugged wells in the AOR which penetrate the top of the confining zone

All available data and records were amalgamated by comprehensive inquiries by Michigan Potash Operating, the EPA, to the Michigan Geological Survey, the Michigan Department of Natural Resources, and the Michigan Department of Environmental Quality, and Western Michigan University's Michigan Geological Repository for Research and Education.

Well records for all known wells drilled within the AOR have been comprehensively re-reviewed by an independent third party: the Michigan Geological Survey, and Michigan Geological Repository for Research and Education.

The Michigan Geological Survey prepared wellbore diagrams and compiled the plugging records and well histories for review by the EPA, attached here for all wells in the AOR; and can be referenced hereafter.

Well histories are accompanied by all supporting documentation. It is clear that there are no wells that have been inadequately plugged and abandoned. The supporting documentation has been included with each well that penetrates deeper than the Dundee formation and the confining layers above. The Dundee is the shallowest proposed injection horizon; however, not the preferred injection horizon.

Shallow wells not penetrating any confining layer, typically targeting shallow gas in the Michigan Stray formation at approximately 1800' sub-surface, have not had wellbore diagrams drawn, although their histories have been reviewed.

All wells within the AOR have been thoroughly reviewed and re-reviewed under numerous permits, and re-permitting processes under Part 625 Class III, EPA Area Permit No. MI-133-3G-A0002, and Part 625 Class I, EPA Area Permit Nos. MI-133-1I-0002 and MI-133-1I-0001.

No new wells have been drilled in the AOR since 2000 or earlier, prior to the last permit re-review for Class I Non Hazardous Permits No. MI-133-1I-0002 and MI-133-1I-0001.

No wells have been historically identified as improperly completed, or plugged and abandoned. The independent re-review by Michigan Potash Operating corroborates.

No wells have been identified as a potential cause of threat to any USDW.

A re-review has revealed historically adequate protection of all USDWs and no compromise of the confining or injection zones.

The well drilled within the AOR fall into three distinct categories:

- Depth range 1,500 - 1,800 feet - Wells seeking gas in the Michigan Stray sand.
- Depth range 4,000 - 5,100 feet - Exploratory wells seeking oil and gas in the Dundee, Reed City, and Detroit River strata.

- Depth range 7,900 - 10,900 feet - Wells to evaluate A-1 Evaporate potash deposits and to test for natural gas, particularly targeting the Clinton and Burnt Bluff.

The casing, casing cementing and plugging records have been examined in detail for all wells which penetrate the proposed injection horizons within the AOR.

Therefore, no corrective action plan is required because there are no records indicating any wellbores in the AOR penetrate the confining or injection zone that have not been properly plugged and abandoned.

In the unlikely event that some unforeseen failure of any of the injection wells occur which might jeopardize any USDW:

1. Immediately halt operations of the well.

2. Notify appropriate regulatory authorities of the discovery and nature of the well failure (telephone notification within 24 hours; written confirmation within 5 days).

3. Conduct an investigation into the cause of the well failure; develop corrective action plan to eliminate the problem.

4. Perform necessary remedial work.

C.7 List of Names and Addresses of all Owners of Record of Land within a Quarter Mile of the Facility Boundary, unless waived by the Director

The following list was compiled from land owner records available in Osceola and Mecosta Counties, including tax rolls, plat books, and register of deeds. This includes all owners within ¼ mile of all 3 proposed well locations.

Name	Address
Frank and Rosalie Hodges	510 120th Ave, Hersey, MI 49639
Dale and Jacquelun Bailey	11427 1 Mile Rd, Evart, MI 49631
Randy Morse	5610 Wembley Court, Clarkston, MI 48346
Betty Park	12950 23 Mile Road, Hersey, MI 49639
Aaron and Kyle Maney	1411 115th Ave, Evart, MI 49631
Scott and Brenda Henry	968 120th Ave, Evart, MI 49631
Robert and Sandra Keller	1381 120th Ave, Hersey, MI 49639
Double ZS Ranch, LLC	900 Monroe Ave, NW, Grand Rapids, MI 49503
Samuel Simmon	11218 Dexter Trail, Westphalia, MI 48894
Brian and Joyce Feldpausch	11350 Dexter Trail, Westphalia, MI 48894
Mary Brininstool	PO Box 1007, Evart, MI 49631
Dreux Benoit & Elaine Benoit	4965 Kennedy Drive, Hudsonville, MI 48426
Jimmy and Caralynn Babcock	785 120th Ave, Hersey, MI 49639
Chance and Shilo Cook	701 120th Ave, Hersey, MI 49639
Micheal and Janice Reske	683 120th Ave, Hersey, MI 49639

C.8 A Description of the Methods Used to Locate Wells in the AOR

A comprehensive list of wells, including oil and gas wells, groundwater wells, hydrogeological stratigraphy wells, minerals wells, and injection wells were amalgamated as per the following databases:
Oil and gas wells: _IHS Well Data
http://ww2.deq.state.mi.us/GeoWebFace/
Mineral Wells: Michigan Mineral Well Database
http://ww2.deq.state.mi.us/GeoWebFace/
http://gwmap.rsgis.msu.edu//.
http://www. zipcodemapping.com/ez/4993 9.html
http: //www. deq. state.mi.us/part201ss
http:/lwww.deu.state.mi.us/wdspi
http://www.epa.Rov/superftind/sites/npl/rai.htm
http://www.epa. gov/reRion5/waterluic/cUsites.htm
http ://ww2. deq . state. mi.us/mir/
http:/lwww.dnr.state.mi.us/spatialdatalibrary/pdf_maps/mineral_lease_information/osceola lease information.pdf
http://www.dnr.state.mi.us/spatialdataiibrary/pdf_maps/mineral_lease_information/mecosta lease information.pdf
http://www. deq. state. mi.us/well-logs/
Comprehensive Freedom of Information Act Request for prior applications and reviews: Michigan Department of Environmental Quality and Department of Natural Resources, EPA Region V, UIC Division
Core and database reviews from the Michigan Geological Repository for Research and Education
Studies of the Precambrian Michigan Basin, Michigan Basin Geological Society, 1969 Hydrological Atlas of Michigan, Western Michigan University, Department of Geology, 1981

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT D: MAPS AND CROSS SECTION OF USDWs

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHEMENT D
MAPS AND CROSS-SECTIONS OF USDW

EPA instruction, form 7520-6 (2011):

MAPS AND CROSS SECTION OF USDWs -Submit maps and cross sections indicating the vertical limits of all underground sources of drinking water within the area of review (both vertical and lateral limits for Class I), their position relative to the injection formation and the direction of water movement, where known, in every underground source of drinking water which may be affected by the proposed injection. (Does not apply to Class II wells.)

D.1 Regional Hydrogeology

The area of the proposed facilities are mantled by glacial drift, the result of multiple glaciations of central Michigan.

The surficial geology in the area is made up of water laid moraine and outwash deposits. The area within the AOR occupies an interlobate position between the Michigan Lobe to the west and the Saginaw and Erie Lobes to the east and south during the final glaciation of Michigan. Glaciofluvial and glaciolacustrine sediments were deposited into the interlobate area and the Muskegon Valley formed the major outlet channel for glacial melt water. Because the major ice flow axes were governed by the major topographic elements of the Great Lakes Region, it is probable that similar ice lobes occupied similar positions during earlier glaciations as well. Thus, the stratigraphic sequence encountered in the surface in the plant area may be expected to have sediments which were deposited in similar interlobate depositional environments during each episode of continental glaciation of North America.

Materials representative of sedimentation in several different depositional environments have been identified within the AOR. These include: 1) till - sediment deposited directly from a glacier by lodgment or melt out and without subsequent re-sedimentation by melt water; 2) stagnant ice deposits - sediment deposited in an ice marginal environment where the ice is relatively immobile; 3) glaciolacustrine deposits - sediment deposited in ice marginal glacial 'lakes under relatively low energy conditions; and 4) glaciofluvial deposits - sediment deposited in an ice marginal environment under relatively high energy conditions.

D.2 Local (AOR) Hydrogeology

Bedrock is identified as Jurassic age ‘red-beds,’ the deepest of which occurs at approximately 650’ below ground level.

According to the Geologic Atlas of Michigan compiled by the Department of Geology, Western Michigan University in 1981, red beds of Jurassic age should be encountered at the bedrock surface. All of the test holes which penetrated the bedrock surface have encountered red sandstone and siltstone inter-bedded with gypsum.

The "red bed" sequence made up of red sandstone and siltstone inter-bedded with anhydrite of Jurassic age, forms the uppermost bedrock formation encountered in the AOR. The greatest depth at which potable water can be obtained is considered to be the bedrock surface (base of the glacial till).

The base of groundwater exploration, that is, the greatest depth at which potable groundwater can be obtained, has been determined to be the bedrock surface. Historically, all of the water-bearing zones

tested in the AOR, at the bedrock surface or below yield saline water, with greater than > 35,000 mg/L concentration, (Hydrogeology of Part of Osceola and Mecosta Counties, Michigan, W.A. Menley 3/1985).

Between 1983 and 1989, over 308 hydrological test holes and approximately 60 piezometers cataloging over 33,833 feet of groundwater and soil data was amalgamated for the purposes of adequately understanding and protecting groundwater within the Michigan Potash Operating AOR. The area has been extensively studied from 1983 to 1989 for the sole purpose of hydrological investigation. These test holes and all the associated data has been comprehensively reviewed by the applicant and the data incorporated herein.

- **Figure D1** is a stratigraphic column describing the glacial till and sources of USDWs and the source of USDWs as extensively mapped and defined by W.A. Menley between 1983 and 1989. Glacial Deposits are highly variable, especially closer to ground level. Depths approximate those encountered throughout the AOR.

A detailed description of each hydrological and potential USDW follows Figure D1.

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Stratigrafic Column and Nomenclature of the Hydrological Units in the AOR, as Defined by W.A. Menley

K			Valley train outwash	Sand and gravel coarsening upward, fine to v-coarse sand, pebbles and cobbles, locally cemented, typical of a high energy glacio-fluvial environment.	~ 0'-60' Below GL
J			Glaciolacustrine	Clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common, typical of a low energy glacio-fluvial environment	~ 0'-60' Below GL
H			Stagnant ice/outwash	Silty sandy clay, some pebbles, in part stratified, typical of a stagnant ice depositional environment	~ 0'-60' Below GL
G			Till	Sandy clay till, sparse coarse fraction, typical of a sub glacial depositional environment	~ 0'-60' Below GL
		G/1	Glaciolacustrine	Clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common.	~ 0'-60' Below GL
F	F/1	F/1/d	Outwash	Medium to coarse sand minor gravel, interbeds of silty clay	~ 60'-220' Below GL
		F/1/c	Glaciolacustrine	Clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common.	
		F/1/b	Outwash	Medium to coarse sand minor gravel, interbeds of silty clay	
		F/1/a	Glaciolacustrine	Clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common.	
	Lower F (F/B)		Outwash	Medium to coarse sand, minor silty clay interbeds, minor fine gravel interbeds, K= 650/gpd/sq.ft. Principle USDW when away from surface charge.	~ -80'-220' Below GL
E	Upper E		Stagnant ice	Silty sandy clay, some pebbles, in part stratified	~ 220'-300' Below GL
	E/1		Outwash	Medium to coarse sand minor gravel, interbeds of silty clay, K = 600 gpd/sq.ft, LOWEST USDW.	~ 300'-400' Below GL
D			Till	Sandy clay till, sparse coarse fraction	~ 400-620' Below GL
			BEDROCK	Jurassic Red Beds, >35,000 TDS "BRINE" from here to Center of the Earth	~ 580'-620' Below GL

FIGURE D1. Stratigraphic description of USDW in the AOR.

When in the immediate proximity to surface charge, such as the Muskegon River or a Lake, it is typical to find static water levels at less than 20'-30' Below GL in Units K, J, H, and/or G.

Unit F/1 serves as a plastic clay barrier and confining layer to Unit F. Above sub Unit F/1, perched water tables or unconfined aquifers may be found.

A detailed description of each glacial till deposition feature from shallowest to deepest, is as follows:

Unit K:
Unit K represents the sand and gravel deposits that form the upper part of the alluvial fill along the course of the Muskegon Valley. This unit is well exposed in the Hersey Sand and Gravel pit east of Hersey, located across the Muskegon River. The texture of this unit becomes coarser upward, with coarse clean gravel beds deposited in channels cut into the dominantly sand size overbank deposits. Excellent exposures of these channel sands and overbank deposits can be seen in the high walls of the quarry.

In the gravel pit, the sand and gravel deposits that are being quarried east of 170th Avenue and south of the washing facility are part of older glacio-fluvial deposits that make up Unit F. The sand and gravel deposits west of 170th Avenue and north of the washing plant are part of the alluvial fill along the Muskegon River (Unit K) laid down as part of the outwash deposits during the final de-glaciation of this part of Michigan.

Unit J:
During the final de-glaciation of the study area the Muskegon Valley functioned as a major melt water outlet stream. A melt water valley was incised through the previously deposited Units G and H into Unit F, eroding and removing Sub-Unit F/1 along the course of the Muskegon Valley down to an elevation of about 875 ft. Unit J is made up of fine textured silt and silty clay beds that were deposited in the channel bottom as the channel was in-filled with fine grained alluvial deposits.

Unit H:

Unit H is made up of inter-bedded sand, gravel and till which mantles the hummocky moraine upland in the eastern part of the study area. This unit represents the stagnant ice depositional environment of the final episode of de-glaciation of the study area. Most of the material in Unit H was deposited by melt water on top of stagnant ice. As the ice eventually melted out these materials were re-deposited by slumping and subject to re-sorting by runoff to form the highly variable and complex deposits which form the present land surface in the upland area east and south of the Muskegon River Valley.

Unit G:
Unit G is a silty clay till which is present beneath parts of the hummocky moraine upland east of the Muskegon River deposited during the final glaciation of the study area.

Unit F:
Unit F is a primary aquifer in the AOR. It is a thick sequence of inter-bedded sand and gravel which was encountered in all of the test holes drilled in the study area. Thin interbeds of clay, silty clay and till were encountered within this unit in all test holes. One such interbed has been separately identified as Sub-Unit F/1. The sand and gravel beds are made up mainly of subrounded clasts of igneous, metamorphic and sedimentary rocks. This unit is considered to represent deposition in a high energy glacial outwash environment.

The Muskegon Valley has been incised into Unit F exposing the sand and gravel deposits which have been quarried at the Hersey Sand and Gravel operations east of Hersey. The sand and gravel deposits east of 170th Avenue and south of Hersey Road are part of Unit F.

The hydraulic conductivity of this unit is considered to be about the same as Sub-Unit E/1, that is, k = 600 gpd/ft^2.

The specific yield is considered to be about 0.20. The specific yield is defined as the volume of water released from storage in the aquifer per unit surface area per unit decline of the water table (Freeze and Cherry, 1979, p.61).

The sand beds which overlie Sub-Unit F/1 become finer upward and more silt interbeds are present. A "perched water table" is typically present in the sand overlying Sub-Unit F/1. Similarly, unsaturated sand and gravel beds are typically present beneath Sub-Unit F/1. The presence of unsaturated sands can be detected from the resistivity log. Resistivity values > 100 ohm.ft are considered to be indicative of unsaturated sand and gravel. This interpretation has been verified by comparison of the geophysical logs with the water level in nearby wells and auger holes in which direct observation of the position of the water table can be made.

Sub-Unit F/1:
Sub-Unit F/1 is an extensive layer of plastic silty clay to clayey till that is present throughout the study area except where it has been removed by subsequent erosion along the course of the Muskegon Valley or where its continuity has been disrupted in collapse structures.

The Sub-Unit F/1 is a continuous glacio-lacustrine deposit present within Unit F throughout most of the AOR. It serves as a barrier and confining interval to aquifers below.

The Sub-Unit F/1 is a saturated, plastic, silty clay. The upper part of the clay is indistinctly laminated and mottled pink and gray, grading downward to a drab light gray color. In some test holes, floating sand grains are present in the silty clay, at other locations the texture approaches that of a silty clay till. Sub-Unit F/1 ranges in thickness from about 8 - 15 ft beneath the plant site.

In Section 36, Township 17N, Range 9W, Sub-Unit F/1 thickens to about 70 ft. It is made up of 2 to 3 distinct clay beds separated by sandy till.

In Section 26, Township 17N, Range 9W Sub-Unit F/1 is about 40 ft thick. It is made up of an upper and lower silty clay bed separated by a sandy till layer.

Unit E:
This unit is a complex mixture of inter-bedded sand, gravel, and till, characterized by highly variable resistivity and gamma ray log signatures. It is considered to represent deposition in the marginal region of a stagnant continental glacier.

Sub-Unit E/1:
Sub Unit E/1 is a principle aquifer in the AOR. This unit is present at the base of Unit E throughout the AOR. It is made up of sand and gravel which is considered to have been deposited in a high energy outwash environment. ***It is the lowermost aquifer present above the base of groundwater exploration.***

Due to the number of accessible sources of ground water above the Sub-Unit E-1, at shallower depths, it is not used as a common source of household water.

Prior to 1984, there was not a well completed in this interval. In 1984, the PPG Bass 84-06 was completed as an observation well in Sub-Unit E/1. This well provided the first information about the aquifer coefficients of Sub-Unit E/1 as well as the hydraulic head and water quality because there were no existing water wells completed in this aquifer in the AOR.

In November of 1984 a short duration pumping test was run to estimate the transmissivity of Sub-Unit E/1.

The test was conducted at a rate of 27 US gpm for 2 hrs, followed by a 40 minute recovery test, with a determinate Transmissivity$_a$ = T_a = 36,000 gpd/ft, and k = T/m = 36,000/60 = 600 gpd/ft^2

The water analysis from PPG Bass 84-06 was determined on a water sample collected January 16, 1985. The results are included in Appendix B. The water is a calcium-sulphate/bicarbonate water having a concentration of about 730 mg/L and a specific conductance of 1,025 micro ohms/cm @ 25°C. The total hardness of the water is about 463 mg/L as $CaCO_3$.

Unit D

Unit D is glacial till which was encountered overlying the bedrock surface or Unit A throughout the study area. It is a reddish brown to pinkish gray, calcareous sandy till which has very uniform geophysical log characteristics. Unit D represents sedimentation in a glacial depositional environment, either as lodgment till or as till deposited by basal melting of a stagnant ice sheet.

80.00% of all water wells in the area are 200' or shallower. Industrial use is preferentially taken to deeper horizons, so as to access water that is not being drawn by household or agricultural use.

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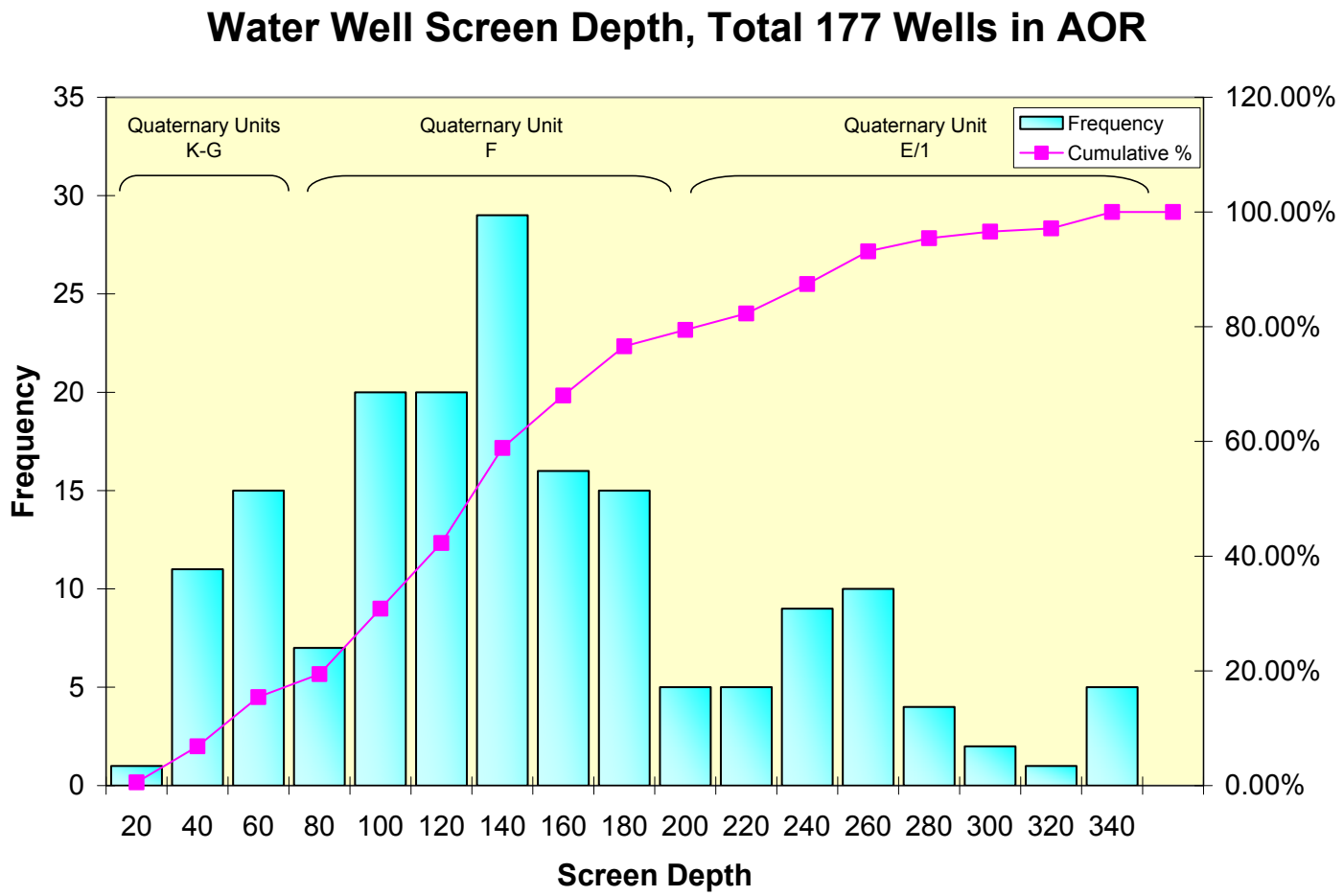


Figure D2. (Above) A cumulative histogram showing the producing depths of all water wells within the AOR. Shallower intervals tend to be closer to surface re-charge, such as the Muskegon River. The depths listed here are depths below ground level. Several of the deeper wells, drawing from the Quaternary Unit E/1 are of industrial purpose, owned and operated by Mosaic Hersey Potash, LLC.

While the deepest screen completion depth within the AOR is no greater than 340' below ground level, another 200' of glacial till and potential sources of water with less than 10,000 TDS occurs until the Jurassic Redbeds.

The lower most glacial till Unit D, is a clayly, silty, confining layer with minimal to no vertical permeability. Blow Unit D, observed TDS is greater than 35,000 in the Jurassic Redbeds. This is likely due to the increasing concentration of anhydrite and gypsum deposition as depths are increased.

In fact, the E/1 unit, which is principally utilized for industrial purposes, is a calcium sulfate ($CaSO4$) based water as described by W.A. Menley. $CaSO4$ is the principle natural composition of gypsum and anhydrite.

- **Figure D3** (RIGHT) is a type curve of the natural gamma ray radioactivity of the hydrological unit in the AOR. This is from the PPG Parks 84-15, located in the NW/4SW/4 Section 31, Evart Township. This is in the immediate proximity to the proposed injection wells. The depth scale shows both measured depth and depth subsea.

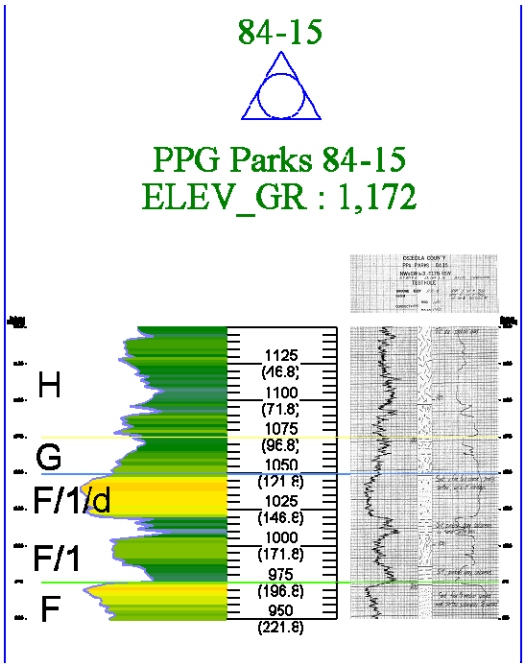


FIGURE D3.

The F/1 Unit which is described as a clay and silty clay, laminated to bedded, some interbeds of silt, massive silty sandy clay with pebbles common, serves as a hydrological barrier between confined and unconfined subsurface water systems.

The F/1 Unit confines the lower F Unit aquifer. It also serves as a vertical transmissibility barrier.

- **Figure D4** is a map showing the hydrological test wells drilled in the area for the sole purpose of mapping, understanding, and protecting the groundwater and any USDW within the AOR. These well locations have been used, in addition to water wells, to test and map the hydrological units and associated static ground water level.

- **Figure D5** is a cross section from the above referenced PPG Parks 84-15 hydrological well to the PPG Babcock 85-13 hydrological well located in the NE/4NE/4 Section 36. The cross section moves from South to Northerly. There are control wells in this cross section that penetrate the entire quaternary aquifer system and encounter the Jurassic Bedrock. Also in the cross section is a proposed injection location to give point of reference to the quaternary hydrological units that will be intersected by the proposed injection well.

- **Figure D6** is a cross section extending across the entire AOR, spanning an approximate 3.5 mile length from South to North, crossing the reference wells utilized in Figure D5.

- **Figure D7** is a cross section extending across the entire AOR, spanning an approximate 5.5 mile length from West to East, crossing the reference wells utilized in Figure D5. Also in the cross section is a proposed injection location to give point of reference to the quaternary hydrological units that will be intersected by the proposed injection well.

- **Figure D8** is a cross section generated by W.A. Menley, spanning and approximate 4.0 mile length from Northwest to Southeast across the AOR.

- **Figure D9** is a surfical geological soil map compiled from soil surveys from over 308 hydrological test holes and approximately 60 piezometers cataloging over 33,833 feet of groundwater and soil data compiled by W.A. Menley over the AOR. Contours showing the observed water table of the Upper Unit F are shown ontop of the soil catalogue.

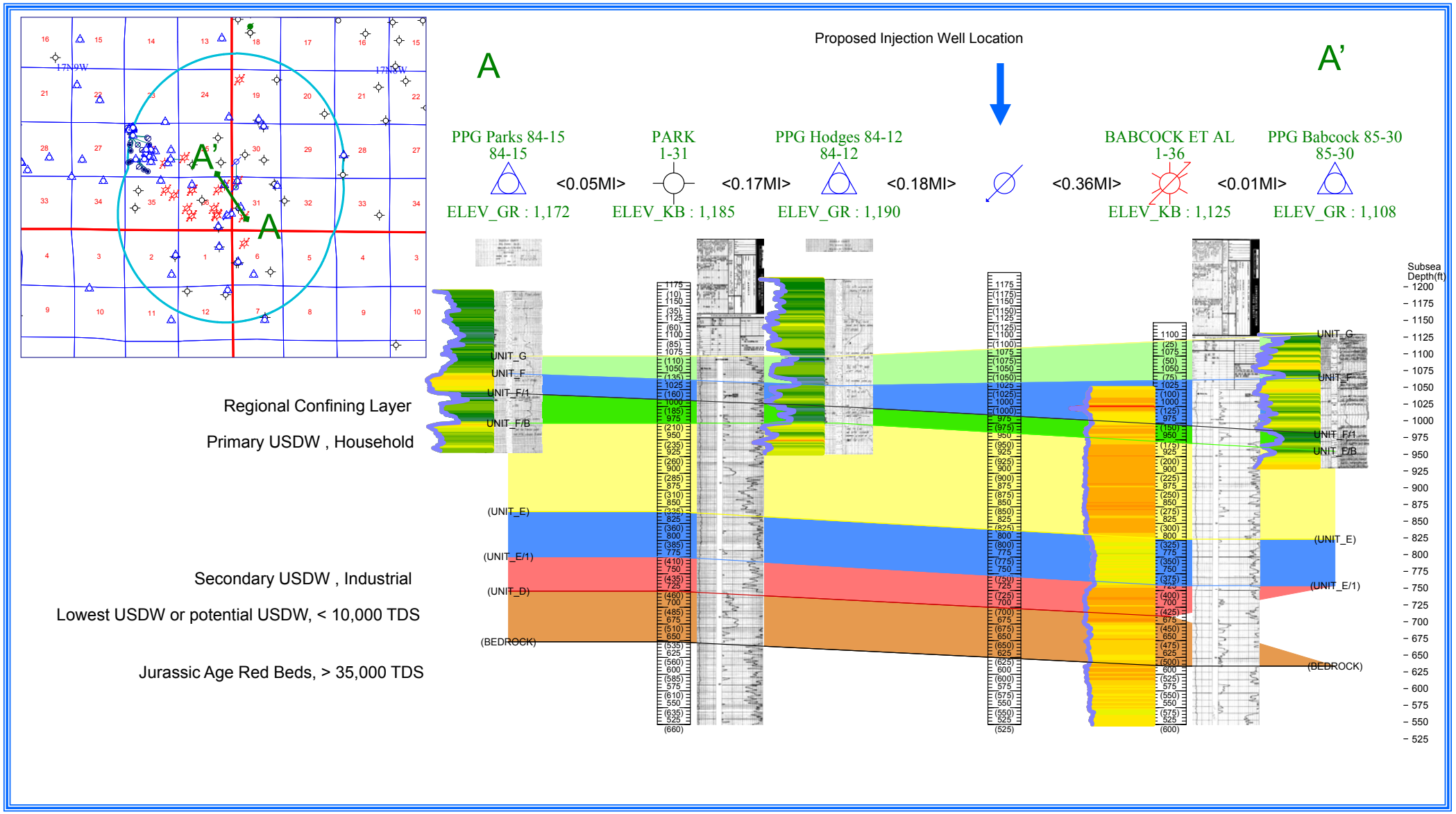


Figure D5. A cross section across in the immediate vicinity of the proposed injection wells. The cross Section A-A' and the path that it follows from South to Northerly, can be seen in the samll reference map in the upper left corner. This cross section included hydro-geological wells, mineral wells and gas wells.

MICHIGAN POTASH OPERATING, LLC

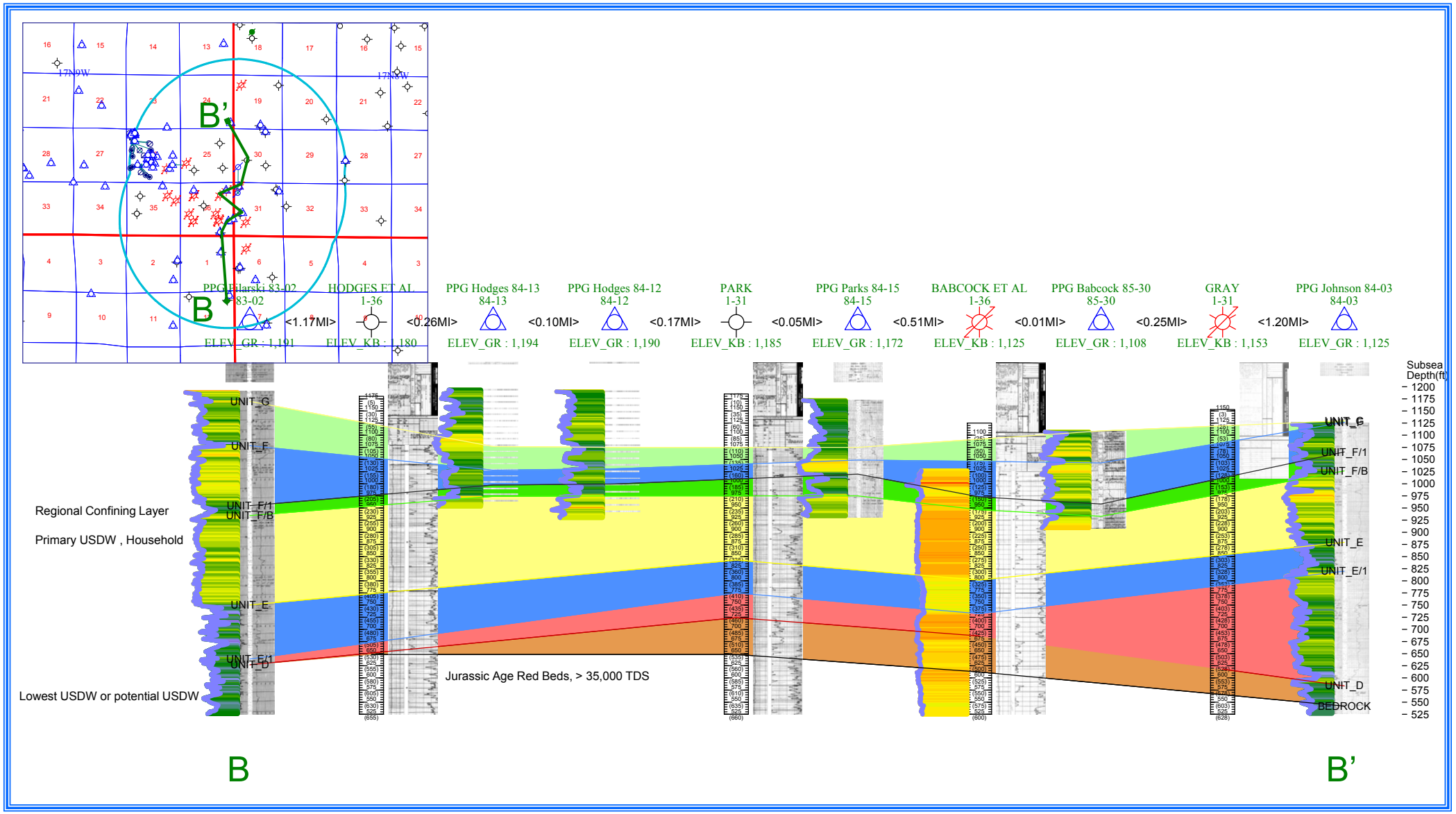


Figure D6. is a cross section extending across the entire AOR, spanning an approximate 3.5 mile length from South to North, crossing the reference wells utilized in Figure D5. The cross section path can be referenced by the small map in the upper left hand corner.

MICHIGAN POTASH OPERATING, LLC

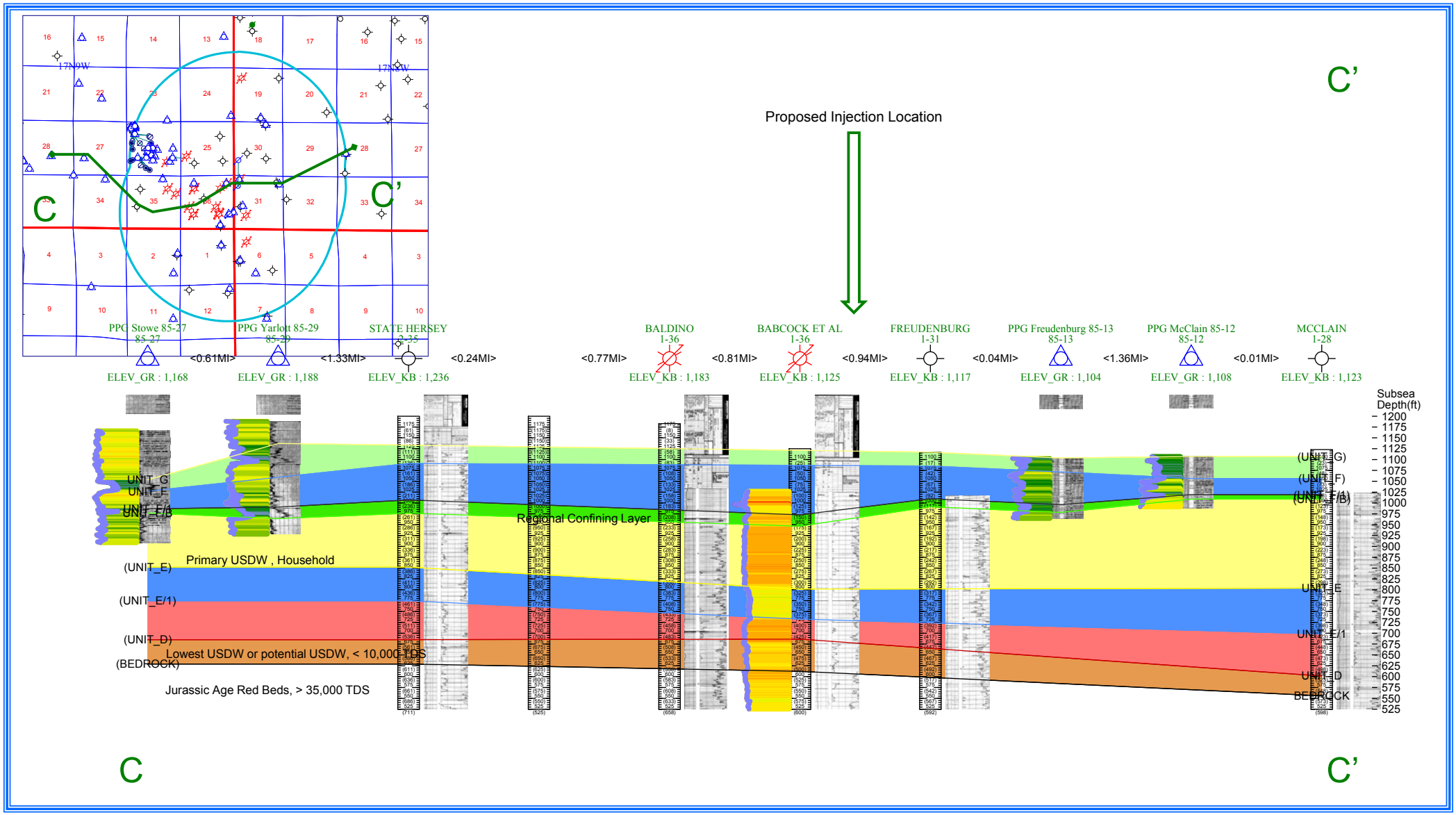
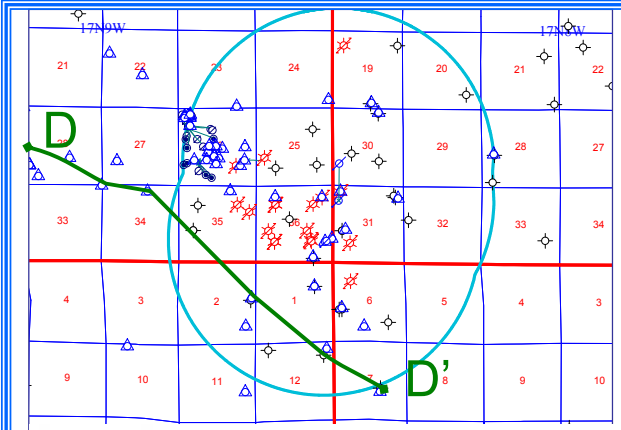


Figure D7. A cross section extending across the entire AOR, spanning an approximate 5.5 mile length from West to East, crossing the reference wells utilized in Figure D5. The cross section path can be referenced by the small map in the upper left hand corner.

MICHIGAN POTASH OPERATING, LLC



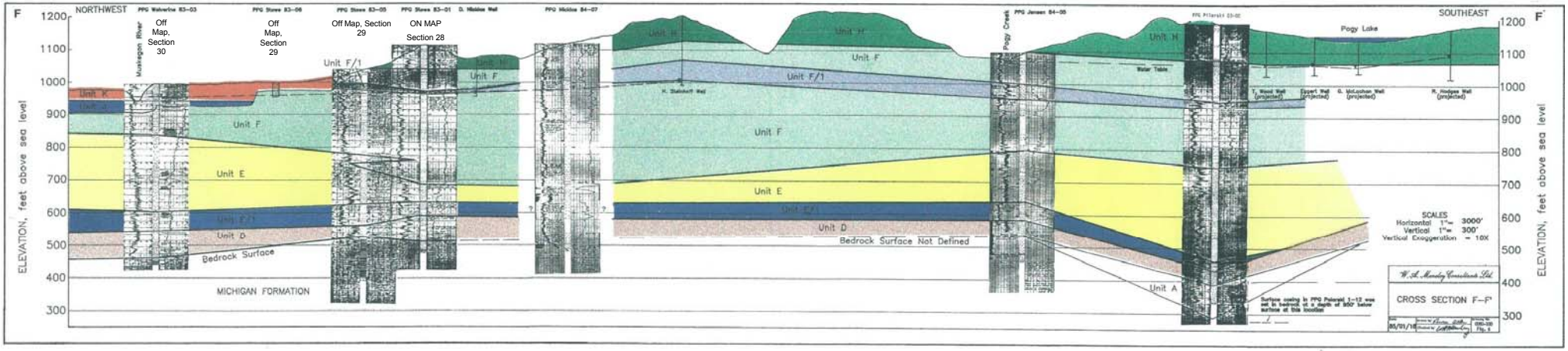
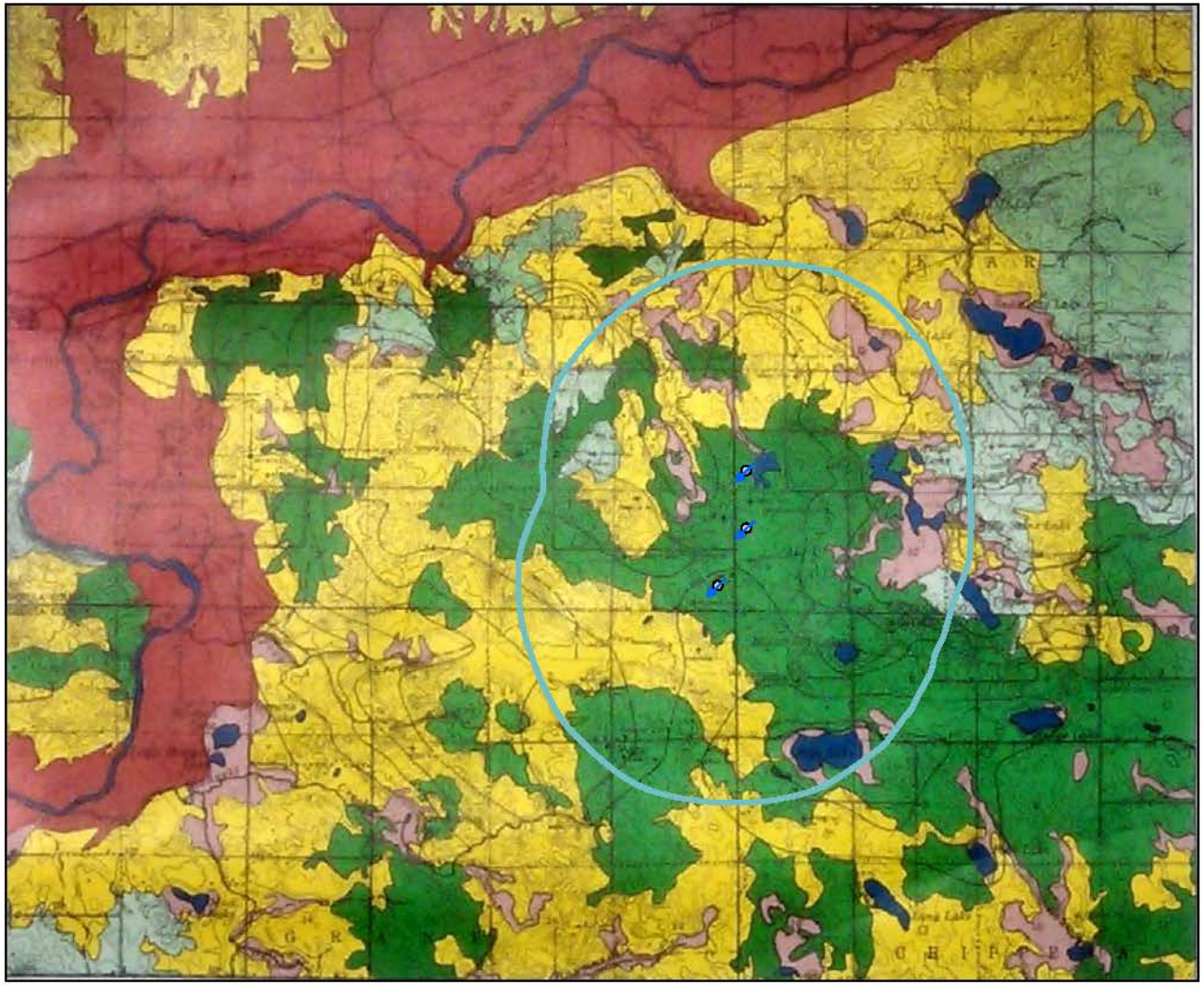


Figure D8. A cross section generated by W.A. Menley, spanning and approximate 4.0 mile length from Northwest to Southeast across the AOR.

MICHIGAN POTASH OPERATING, LLC



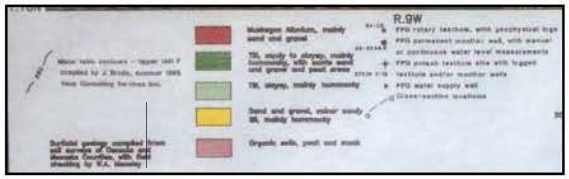


Figure D9. A surfical geological soil map compiled from soil surveys from over 308 hydrological test holes and approximately 60 piezometers cataloging over 33,833 feet of groundwater and soil data compiled by W.A. Menley over the AOR. Contours showing the observed water table of the Upper Unit F are shown on top of the soil catalogue. The AOR radius is also shown.

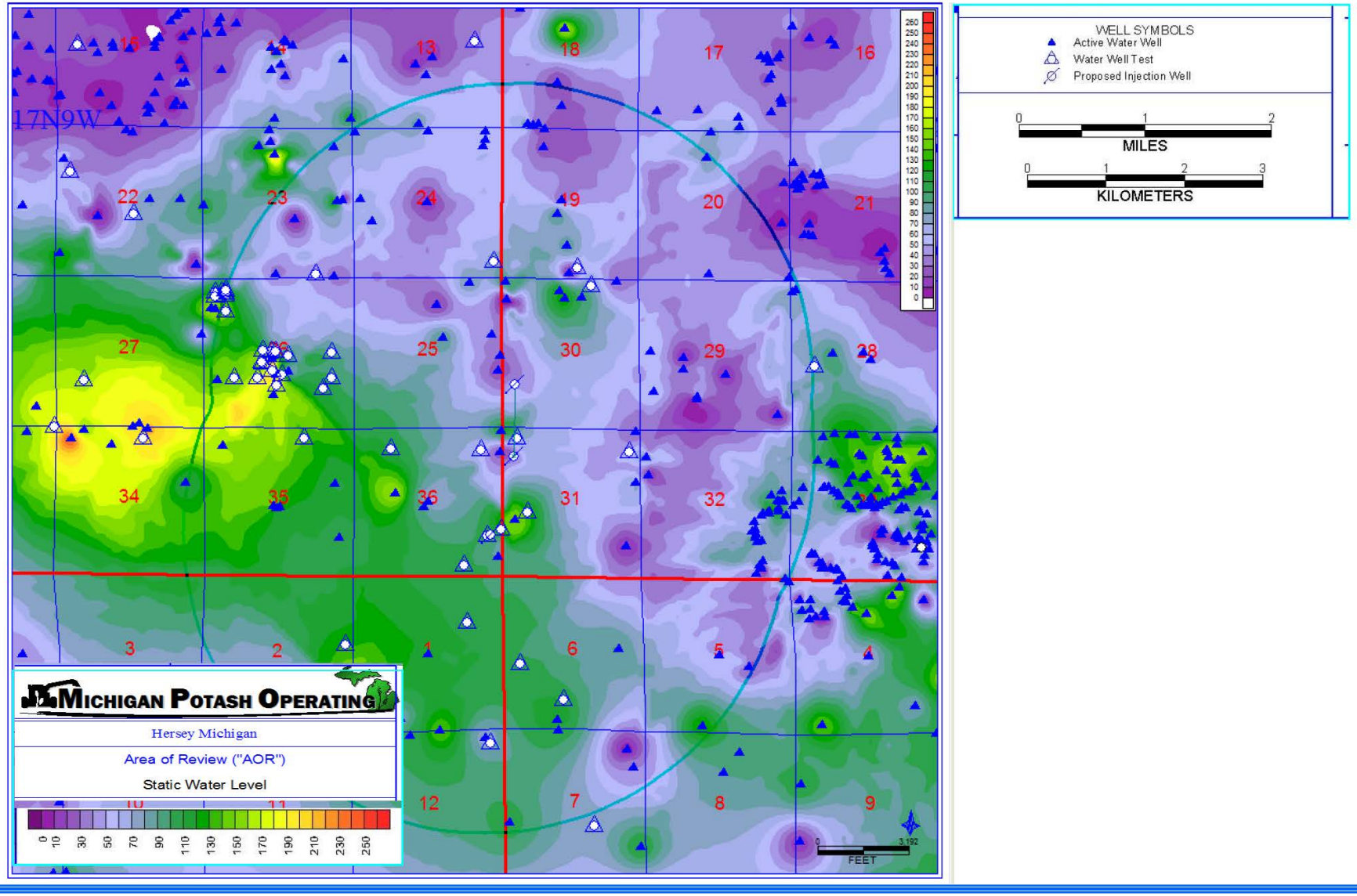


Figure D10. is a map showing the static water level as encountered in every water well within the AOR. The static water level is shown as feet below ground level.

Figure D10 is a map showing the static water level as encountered in every water well within the AOR. The static water level is shown as feet below ground level. These contours are generated principally from reported and measured static water levels as extensively gathered and made available by the Michigan State ground water mapping project and Michigan Department of Environmental Quality, Water Division.

The extensive geological understanding and well control of the hydrological units within the area, give extra assurance that all USDW or potential USDW or any freshwater sources of water of any kind, whatsoever, are thoroughly and adequately protected and monitored.

D.3 Lowermost USDW

As described above, the lowest USDW is the Sub Unit E/1, or clay/till in unit D before saline Jurassic age red-beds are encountered.

Within the entire AOR, the lowest occurrence of the glacial drift occurs at approximately 614 feet. This is considered to be the base of the lowermost USDW - an area defined by the USEPA as an aquifer containing less than 10,000 parts per million of total dissolved solids (TDS). Below the glacial till and into the Jurassic redbeds, TDS is typically in excess of 35,000.

The lowest producing USDW in the AOR is at 340'; however, by federal US EPA standards, glacial till qualifies as the lowermost USDW and its deepst point in the AOR is at 614'. Based on hydrostatic analysis and direct drawdown tests associated with the E/1 unit at 340' and the observed static water level in the area (Figure D10), it is expected that the static water level at the lowest USDW, or 614' would approximate would approximate 130', which would be a hydrostatic head level of 209 psi.

D.4 Quaternary Aquifers

All USDWs described in Section D.2 are from Quaternary glacial deposits. Quaternary deposits come in direct contact with Jurassic age, bedrock in the AOR, as previously described.

The cross sections and the data compiled by PPG has been incorporated into all regional studies performed over the AOR.

Restated, three main quaternary aquifers exist in the AOR:

Along Muskegon River - shallow wells (<50 feet) completed in valley fill deposits within the river valley - not a really extensive but can sustain high pumping volumes.

Unit H - shallow wells (<100 feet) completed in moraine deposits - not a really extensive but adequate for most domestic and agricultural potable water sources.

Unit F - wells completed from 150 to 250 ft in a really extensive prolific producing outwash deposits

Unit E/1 – 250 to 614 ft water wells completed principally for industrial use.

D.5 Bedrock Aquifers

There are NO Bedrock aquifers in the AOR supplying any water, whether fresh or saline for any purpose.

Within the AOR, which deep and basin centered, none the bedrock aquifers contain any water with less than 35,000 mg/L concentration of water (Hydrogeology of Part of Osceola and Mecosta Counties, Michigan, W.A. Menley 3/1985).

For clarification purposes, an aquifer is defined as a system that has the ability to transmit water with porosity and potential permeability. All of the below listed zones may have that ability, but are deep, confined, and saturated with extremely highly TDS and chloride content, and/or oil and natural gas and are not suitable for any use, industrial or otherwise.

Restated, the below systems do not constitute any source of potable or usable source of water for industrial or any other purpose. They are deep, confined, and highly saline. In fact, most of the below mentioned zones are either Oil and Gas bearing reservoirs, or have been used as disposal horizons throughout Michigan and in Osceola or Mecosta County.

Pennsylvanian Aquifer System

Chemical analysis data indicate TDS and chloride content in Palma Sandstone and other Pennsylvanian age systems contain of 234,000 mg/1 and 141,000 mg/1, respectively in Mecosta County.

This system includes the sandstones of the Saginaw and Grand River Formations. It overlies the Mississippian sandstones of the Marshall and Michigan Formations and is overlain by the "red beds" of Jurassic time. At no place is the Pennsylvanian System 1,000 feet below sea level in Michigan. No areas of subsidence or catastrophic collapse due to solution mining are known to occur in Pennsylvanian rocks.

Mississippian Aquifer System

Chemical analysis data indicates an average IDS and chloride content in the Marshall Sandstone are 254,880 mg/1 and 150,136 mg/l, respectively in Mecosta County and 267,000 mg/1 and 142,000 mg/1 in Osceola County.

This system includes the sandstones of the Marshall Sandstone and the Michigan Formation which includes the Bayport Limestone. It overlies the Mississippian Coldwater Shales and is overlain by the Pennsylvanian sandstone and shales. The Mississippian Berea Sandstone is an aquifer in the area of subcrop beneath the glacial drift in southeast Michigan. No areas of subsidence or catastrophic collapse due to solution mining are known to occur in Mississippian rocks.

Devonian Aquifer System

Chemical analysis data indicates an average TDS and chloride content in the Dundee are 305,000 mg/1 and 162,000 mg/1, respectively in Mecosta County and 270,000 mg/1 and 147,000 mg/1 in Osceola County.

This system includes the sandstones of the Sylvania Sandstone and the carbonate rocks of the Detroit River, Dundee Limestone and Traverse Groups. It overlies evaporate and carbonate rocks of Silurian age and is overlain by shale of Mississippian or Devonian age. No areas of subsidence or catastrophic collapse due to solution mining are known to occur in Devonian rocks.

Silurian Aquifer System

This system includes the carbonate and evaporate rocks of the Niagara Series, the Burnt Bluff and Manistique Groups and the Engadine Dolomite, the Cayugan Series, Salina and Bass Island Groups. It overlies the Silurian shades and carbonates of the Cataract Group and is overlain by Devonian carbonate rocks of the Garden Island Formation and Detroit River Group. Silurian formations are important hydrocarbon producing formations in Michigan. No areas of subsidence or catastrophic collapse due to solution mining are documented for Silurian rocks, though the Salina Group evaporate are the most important source formations for artificial brine production in Michigan.

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US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT E: NAME AND DEPTH OF USDWs

DOES NOT APPLY TO CLASS I NON HAZARDOUS

THE UNITED STATES POTASH PROJECT
JANURARY 2015

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT F: MAPS AND CROSS SECTION OF GEOLOGIC STRUCTURE OF AREA

THE UNITED STATES POTASH PROJECT
JANURARY 2015

ATTACHEMENT F
MAPS AND CROSS-SECTIONS OF GEOLOGIC STRUCTURE OF AREA

EPA instruction, form 7520-6 (2011):
Submit maps and cross sections detailing the geologic structure of the local area (including the lithology of injection and confining intervals) and generalized maps and cross sections illustrating the regional geologic setting. (Does not apply to Class II wells.)

F.1 Regional Geologic Setting

The Michigan Basin is a sedimentary basin centered in the Lower Peninsula of the US State of Michigan. The feature is represented by a circular pattern of geologic sedimentary strata with a nearly uniform structural dip toward the center of the peninsula (Figure 1). The extent of evaporative deposits and other shallow water deposits suggest concurrent subsidence during basin filling. High evaporation rates during the Silurian and Devonian geologic periods resulted in massive and pure bedded halite (NaCl), and the possibility of potassium chloride (KCl) in select locations due to mineral rich sea water.

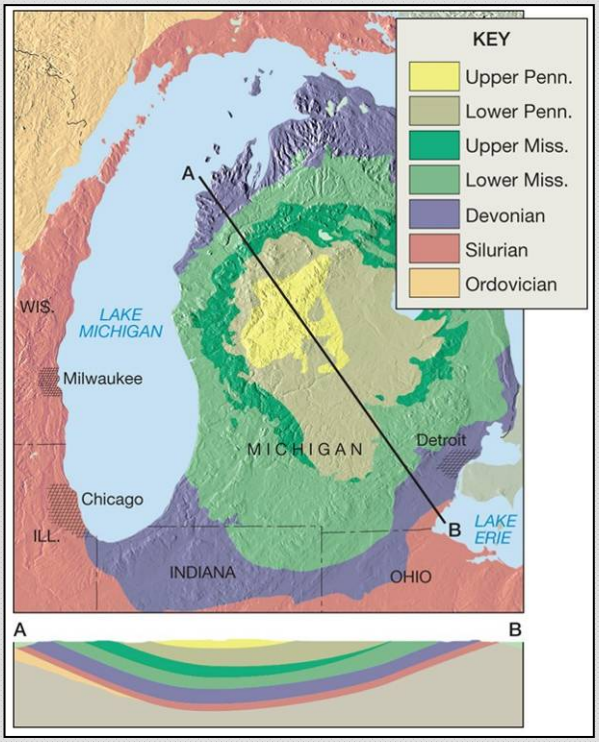


Figure F1. A geologic map of the sedimentary basin of Michigan, with a cross section shown from A to B. Salt occurs in Devonian Age (Blue). Salt and Potash occur in the Silurian Age (Red).

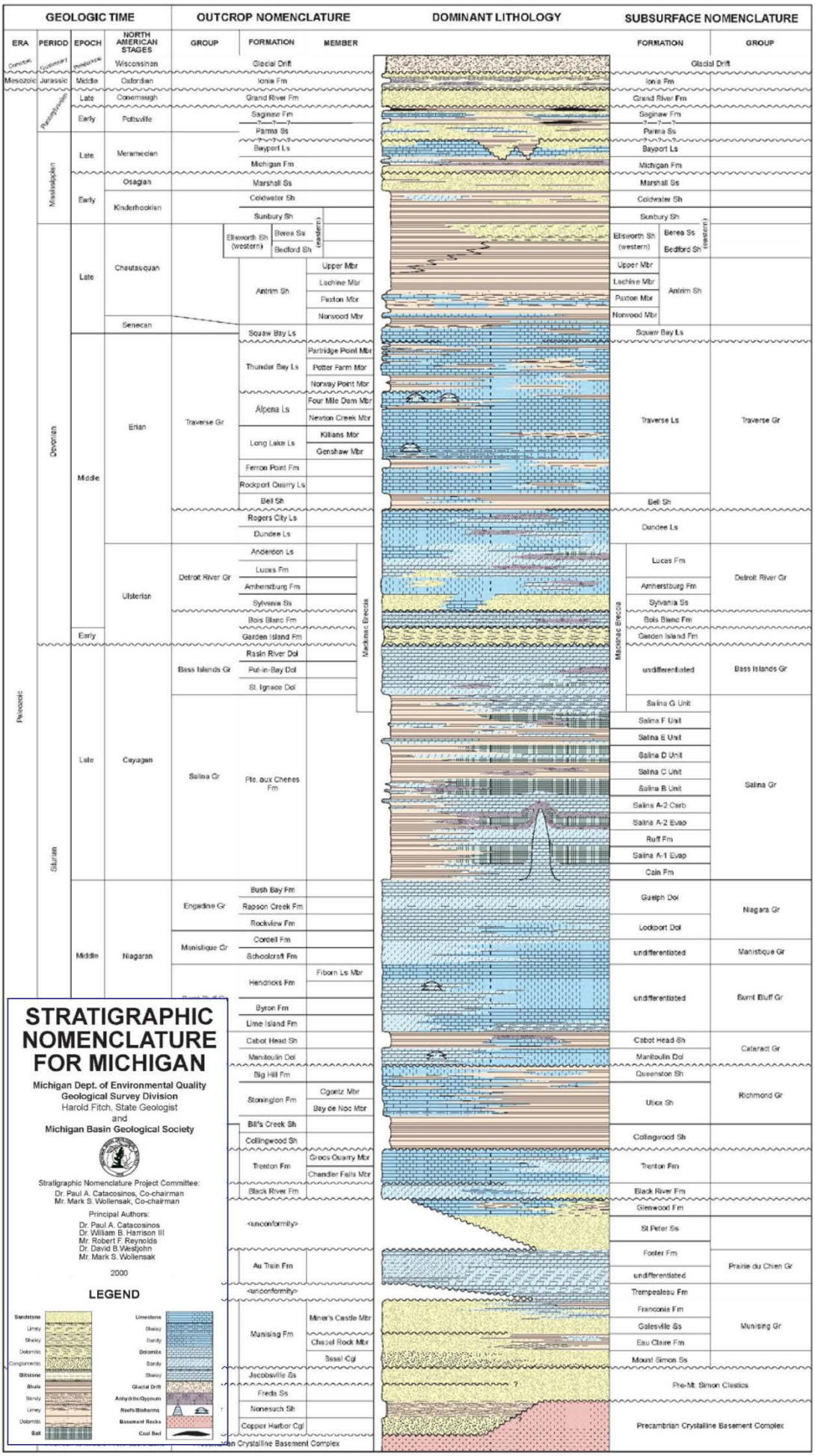
Massive bedded halite occurs in beds of the Silurian Salina Formation, and the Devonian Detroit River Group. Dow Chemical began mining Michigan's salt rich brines in 1897, creating a commercial source of potassium, calcium, and magnesium salts, bromine, and iodine. Dow Chemical remains headquartered in Midland, Michigan. Morton International, Martian Marietta Materials, and The Detroit Salt Company are other salt and mineral producers with an economic interest in salt and salt related deposits in Michigan.

The Michigan Basin is the dominant structural feature of the Michigan southern peninsula. It is a nearly circular and symmetrical structural and sedimentary basin. A maximum aggregate thickness of about 14,000 feet of Cambrian through Jurassic sedimentary strata was deposited in the basin. The basin first developed as a structural feature in late Silurian time during which approximately the middle one-third of the total sedimentary rock formation was deposited.

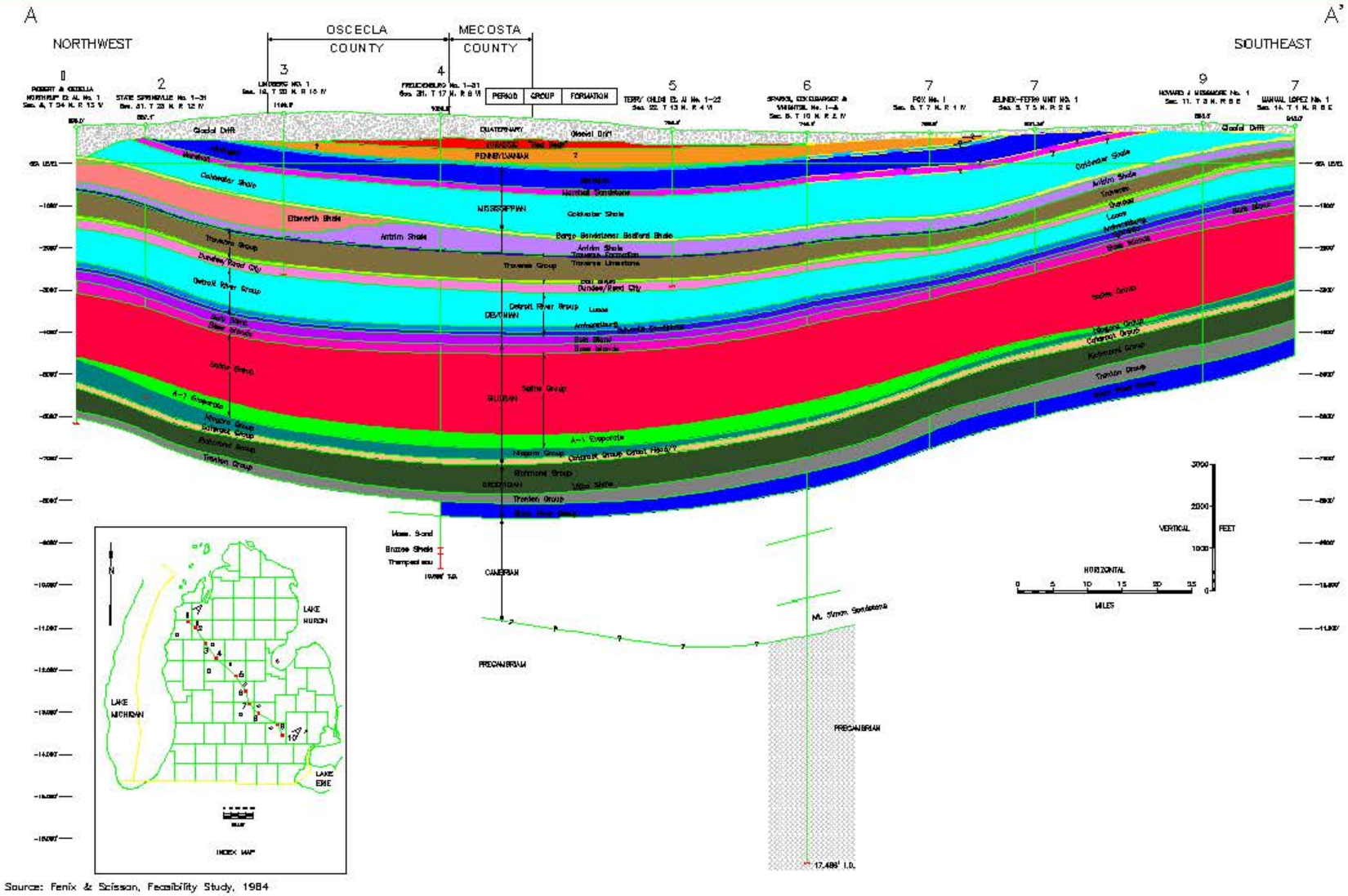
- **Figure F1** (Above and Right) is a generalized map of the sedimentary basin sedimentary basin of Michigan.

- **Figure F2** is the Michigan stratigraphic column illustrating the lithology of the sediments which fill the Michigan Basin and occur in the AOR.

Figure F2. Figure F2 is the Michigan stratigraphic column illustrating the lithology of the sediments which fill the Michigan Basin and occur in the AOR.



MICHIGAN POTASH OPERATING, LLC



Source: Fenix & Scisson, Feasibility Study, 1984

Figure F3. A detailed northwest-southeast regional cross-section through th estate of Michigan, drawn through the AOR, utilizing the deepest well in the AOR (Fruedenburg 1-31 - 10,858 feet), which is in the same section as the proposed injection locations (Section 31, Evart Township, Osceola County, Michigan).

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The southern Osceola/northern Mecosta County area is covered by several hundred feet of Pleistocene glacial drift. The glacial deposits rests on Jurassic "red bed" sediments of Pennsylvanian shale and sandstone. The Paleozoic rock section, from Pennsylvanian downward, likely exceeds 10,000 feet in the area, and includes shale, limestone, dolomite, sandstone, anhydrite, and salt. The Precambrian basement beneath the Paleozoic deposits is not known to have been penetrated in the area but is thought to lie over 11,000 feet below the surface.

- **Figure F3** is a detailed reproduction of the northwest-southeast regional cross-section shown in Figure F1, drawn immediately through the AOR. The section utilizes the deepest well in the area (Freudenberg 1-31 - 10,858 feet), which is in the same section as the proposed injection locations (Section 31, Evart Township, Osceola County, Michigan). This cross section also utilizes the deepest reported well in the Michigan Basin (Sparks, Eckelberger, and Wrightsil 1-8 - 17,466 feet). Figure F3 shows the structural configuration of the injection and confining intervals, a bowl-shaped pattern which illustrates the shape of the Michigan Basin. This figure has a vertical exaggeration approximating 50 to 1.

F.2 Proposed Injection Horizon

From deepest to shallowest, Michigan Potash Operating proposes to inject into the:

Bass Island Dolomite, at approximately 5,400' below surface, the
Sylvania Sandstone, at approximately 5,170' below surface, and the
Reed City Dolomite at approximately 3,970' below surface.

The Reed City Dolomite will only be accessed for injection in the event the Bass Island Dolomite and Sylvania Sandstone are incapable of taking the proposed injection volumes.

Michigan is a historical oil and gas province and rich brine producing province. As a result, there is well established data for injection and rock and fluid interaction, with over 2,071 established injection wells.

- **Figure F4 (next page)** is a graphical illustration, from shallowest to deepest, of the stratigraphic horizons currently being utilized in the State of Michigan for fluid injection. This graph shows both Part 615 Oil and Gas Wells and Part 625 Mineral Wells. This graph can be easily cross referenced with **Figure F3.**

- **Figure F5 (next page)** is an excerpt from Figure F2 with particular focus on the injection and confining zoned closest to the proposed horizons. The Reed City Dolomite occurs in the Dundee LS Formation group. This figure is presented in great further detail, by horizon on Figures F6-F9, for each proposed injection horizon.

In the State of Michigan most injection occurs in the Dundee Limestone or shallower due to the ease of access of shallow injection horizons and excellent confining intervals at shallow depths.

Michigan Potash Operating proposes to drill to 5,550' Truve Vertical Depth, for all three wells, targeting the Bass Island Group at total depth.

The MPC 2D will be a directional well with a bottom hole location due north, with an approximate throw of 2524' due North. Measured Depth will be 6,185'.

The intended injection horizons are the Sylvania Sandstone and the Bass Island Group. The two zones cover an approximate 200' interval, between 5,300' and 5,500'. The well established injection horizon in the Reed City Dolomite at 4,300' will be drilled through, enabling access to a third injection horizon if necessary. The Reed City Dolomite is currently being injected into within the AOR by Mosaic Potash Hersey, LLC.

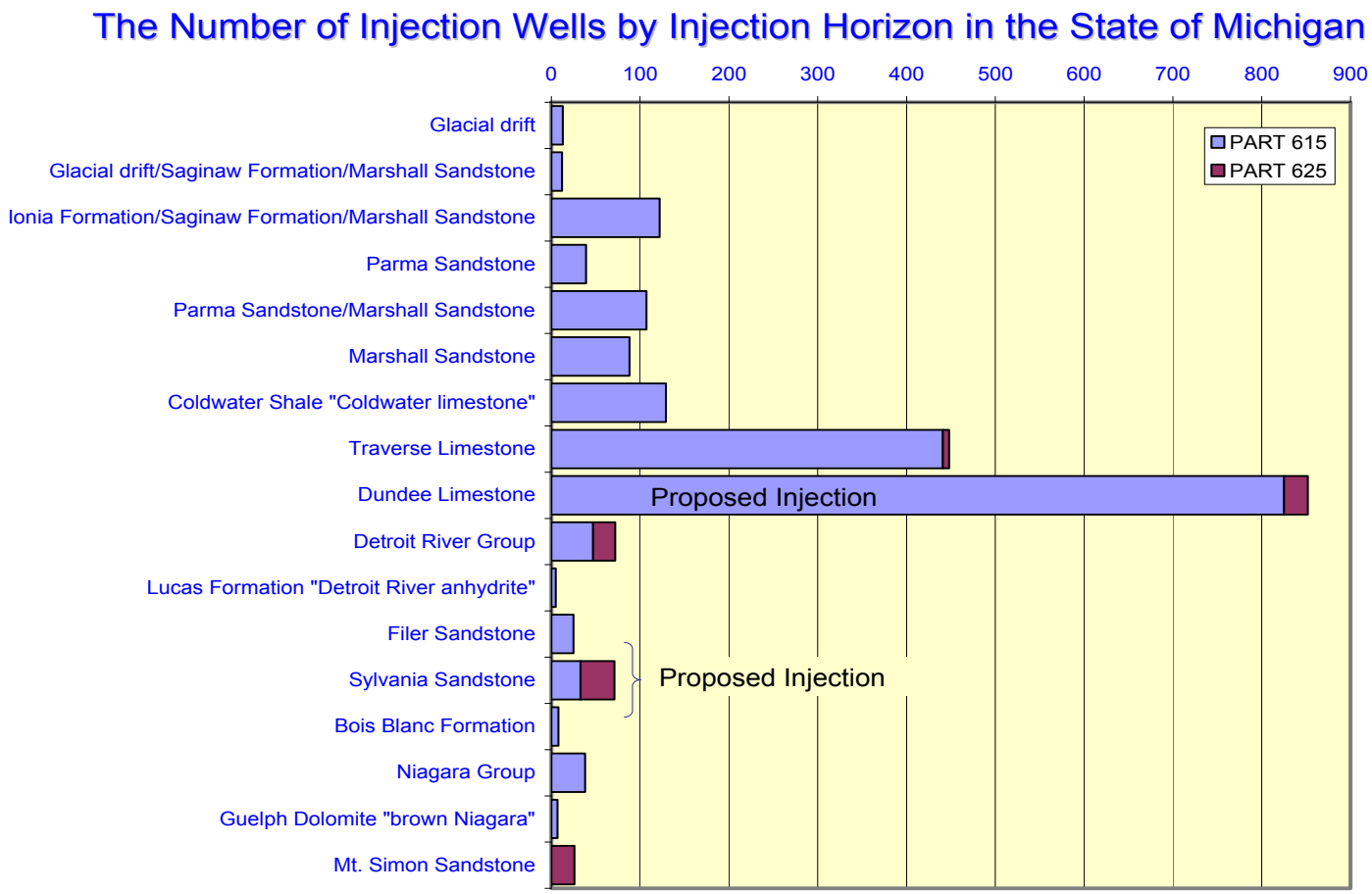


FIGURE F4. A graphical illustration, from shallowest to deepest, of the stratigraphic horizons currently being utilized in the State of Michigan for fluid injection. Also showing the target injection horizons in the Sylvania Sandstone, the Bass Island Group Dolomite, and the Reed City Dolomite (in the Dundee Limestone).

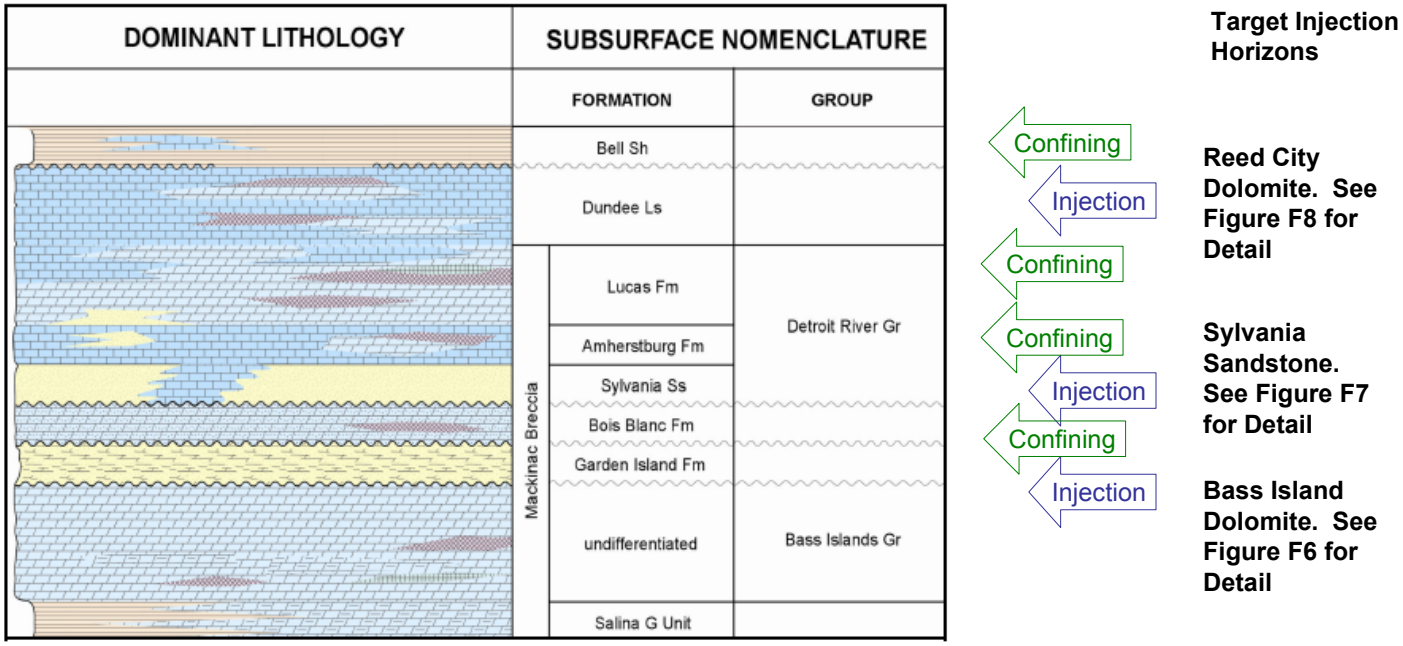


FIGURE F5. The proposed injection horizons, Bass Island Dolomite, Sylvania SS, and Dundee LS.

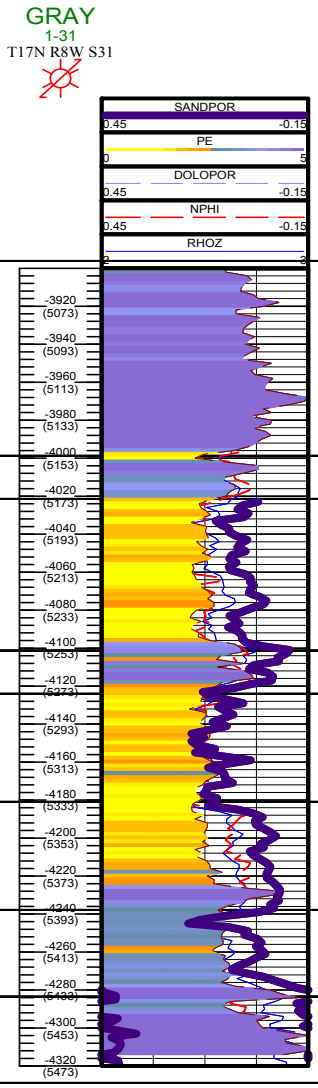
From Deepest to Shallowest,

Figure F6 shows

(1) A regional map of Michigan, showing the net thickness of the Bass Island Dolomite in the entire state, with a reference to the AOR; and

(2) A geophysical type curve of the injection and confining horizons in the Bass Island Dolomite and Sylvania Sandstone from the Grey 1-31, located in the NW/4NW/4 Section 31, which is in the same section of the proposed injection location; and

(3) The porosity of both the injection and confining intervals as determined from well log analysis and core observations; also shown below for ease of refence; and



	Zone	Footage	Porosity	Permeability	Description
Confining	Amhurstberg	>180'	0-1	0-1 md	Dolomite, Dark Brown to Black, very fine to fine intercrystaline, dense calcarious, slight to moderate argilicous.
Injection	Sylvania	80'	7%	10-40 md	Dolomitic Sand, tan, medium brown, mottled, very fine intercyrstaline, calcarious, dense, slightly argilicious
Injection	Sylvania	60'	15%	100-200 md	Sandstone, loose, clear, fair to medium grained, sub-rounded, well sorted, light dolomite cement
Confining	Bois Blanc	60'	0-1	0-1 md	Dolomite, buff, very fine intercrystaline, sandy, tripilitic chert lamination.
Injection	Bass Island	40'	12-17%	20-40 md	Dolomite, tan, medium brown, clean.
Confining	Bass Island Evap	>200'	0-10%	0-1 md	Interlayerd anhydrite and dolomites

(4) The permeability-porosity relationship as determined from extensive core and lithologic studies as performed by Western Michigan University in the Bass Island Dolomite, demonstrating real data, test results, and observations; and

(5) Real lithologic descriptions as observed by the wellsite geologist when drilling through the Freudenberg 1-31, located in the NE/4NE/4 Section 31, which is in the same section of the proposed injection location; and the Grey 1-31.

Michigan Potash Operating, LLC

Bass Island Dolomite Injection and Confining Interval Detail

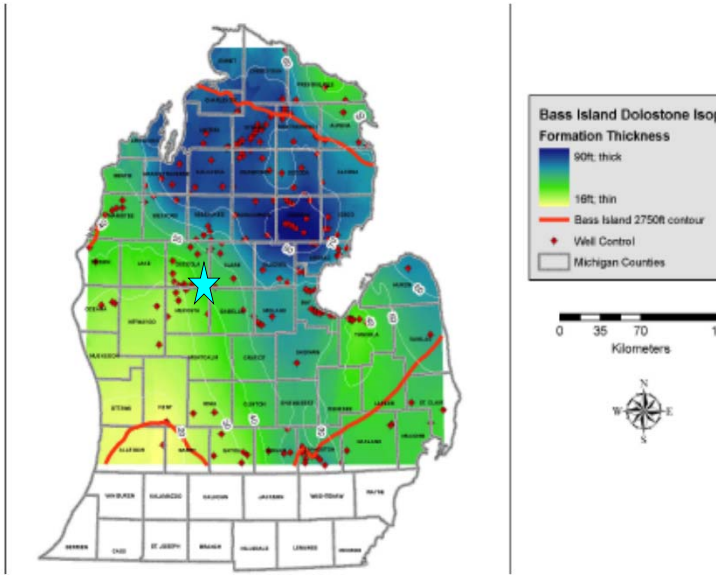
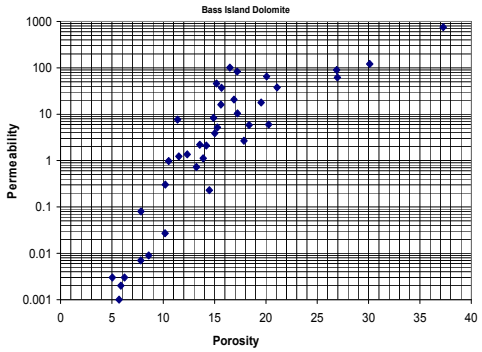
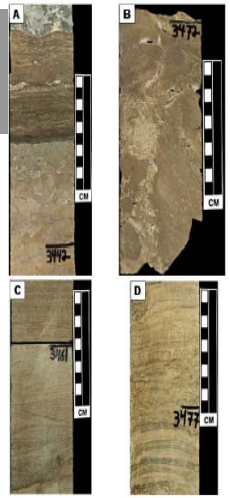
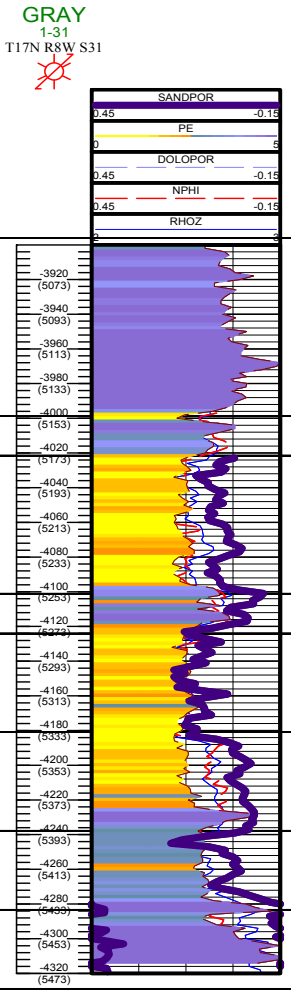


BILD Core Analysis And Lithology







	Zone	Footage	Porosity	Permeability	Description
Confining	Amhurstberg	>180'	0-1	0-1 md	Dolomite, Dark Brown to Black, very fine to fine intercrystaline, dense calcarious, slight to moderate argilicous.
Injection	Sylvania	80'	7%	10-40 md	Dolomitic Sand, tan, medium brown, mottled, very fine intercyrstaline, calcarious, dense, slightly argilicious
Injection	Sylvania	60'	15%	100-200 md	Sandstone, loose, clear, fair to medium grained, sub-rounded, well sorted, light dolomite cement
Confining	Bois Blanc	60'	0-1	0-1 md	Dolomite, buff, very fine intercrystaline, sandy, tripilitic chert lamination.
Injection	Bass Island	40'	12-17%	20-40 md	Dolomite, tan, medium brown, clean.
Confining	Bass Island Evap	>200'	0-10%	0-1 md	Interlayerd anhydrite and dolomites

Figure F6. shows (1) a geophysical type curve of the injection and confining horizons in the Sylvania and Bass Island Group from the Grey 1-31, located in the NW/4NW/4 Section 31 (2) the calculated porosity (3) the permeability-porosity relationship as determined from extensive core and lithologic studies as performed by Western Michigan University in the Bass Island Dolomite (4) a net isopach map of the Bass Island Dolomite in the entire state, as it relates to the AOR (5) real lithologic descriptions as observed by the wellsite geologist when drilling through the Fruendenberg 1-31, located in the NE/4NE/4 Section 31.

- **Figure F7** is similar in nature to Figure F6, however showing different data specific to the Sylvania Sandstone:

  (6) A regional map of Michigan, showing the net thickness of the Bass Island Dolomite in the entire state, with a reference to the AOR; and

  (7) A geophysical type curve of the injection and confining horizons in the Bass Island Dolomite and Sylvania Sandstone from the Grey 1-31, located in the NW/4NW/4 Section 31, which is in the same section of the proposed injection location; and

  (8) The porosity of both the injection and confining intervals as determined from well log analysis and core observations, also shown on the prior page, for ease of reference; and

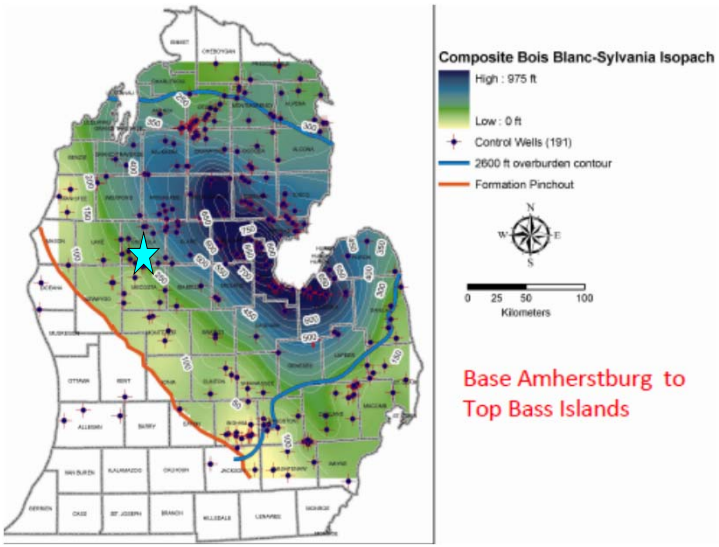
  (9) The permeability-porosity relationship as determined from extensive core and lithologic studies as performed by Western Michigan University in the Sylvania Sandstone, demonstrating real data, test results, and observations; and

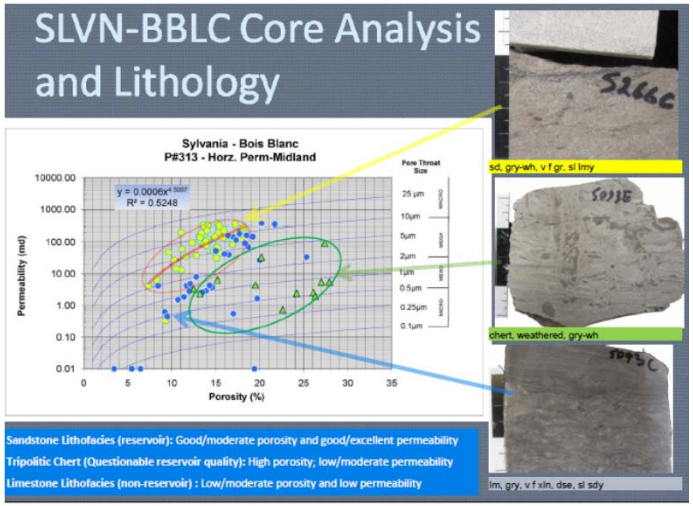
  (10) Real lithologic descriptions as observed by the wellsite geologist when drilling through the Freudenberg 1-31, located in the NE/4NE/4 Section 31, which is in the same section of the proposed injection location; and the Grey 1-31.

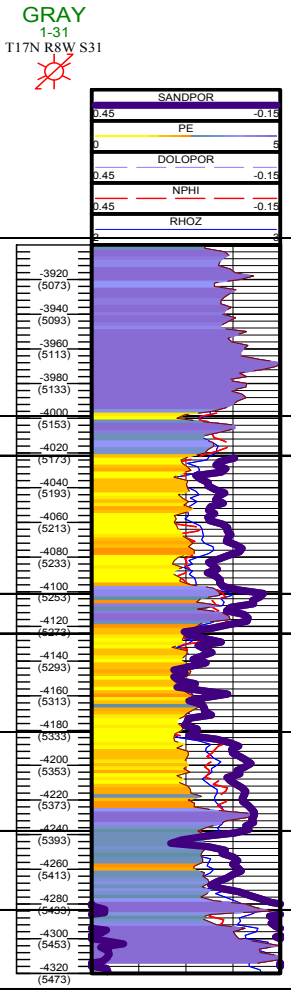
The dense Amhurstberg and tripolitic cherts of the Bois Blanc formations have virtually zero porosity and permeability and serve as excellent, high compressive strength confining intervals. Over 1,500' of interlayered anhydrites, micro-crystalline limestones, and dense dolomites in the Detroit River Group lie above the Amhurstberg.

Michigan Potash Operating, LLC

Sylvania Sandstone Injection and Confining Interval Detail







	Zone	Footage	Porosity	Permeability	Description
Confining	Amhurstberg	>180'	0-1	0-1 md	Dolomite, Dark Brown to Black, very fine to fine intercrystaline, dense calcarious, slight to moderate argilicous.
Injection	Sylvania	80'	7%	10-40 md	Dolomitic Sand, tan, medium brown, mottled, very fine intercyrstaline, calcarious, dense, slightly argilicious
Injection	Sylvania	60'	15%	100-200 md	Sandstone, loose, clear, fair to medium grained, sub-rounded, well sorted, light dolomite cement
Confining	Bois Blanc	60'	0-1	0-1 md	Dolomite, buff, very fine intercrystaline, sandy, tripilitic chert lamination.
Injection	Bass Island	40'	12-17%	20-40 md	Dolomite, tan, medium brown, clean.
Confining	Bass Island Evap	>200'	0-10%	0-1 md	Interlayerd anhydrite and dolomites

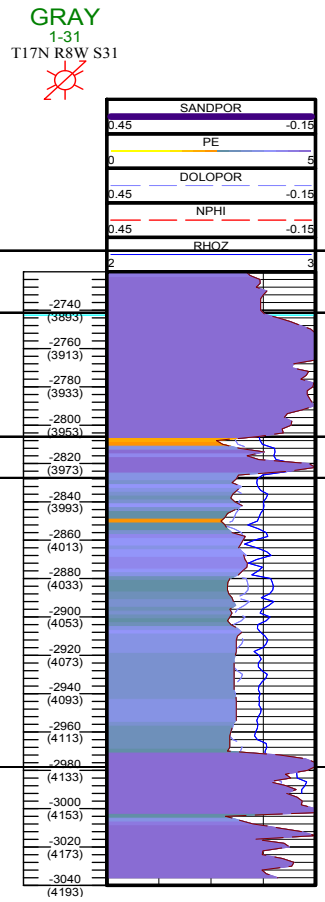
Figure F7. Showing (1) a geophysical type curve of the injection and confining horizons in the Sylvania and Bass Island Group from the Grey 1-31, located in the NW/4NW/4 Section 31 (2) the calculated porosity (3) the permeability-porosity relationship as determined from extensive core and lithologic studies as performed by Western Michgian Univerisy in the Sylvania Sandstone (4) a net isopach map of the Sylvania Sandstone in the entire state, as it relates to the AOR (5) real lithologic descriptions as observed by the wellsite geologist when drilling through the Fruendenberg 1-31, located in the NE/4NE/4 Section 31.

Figure F8 shows:

(11) A regional map of Michigan, showing the net thickness of the Dundee Formation, in the entire state, whereby the Reed City Dolomite is an interval that occurs just below the Dundee Limestone, with a reference to the AOR; and

(12) A geophysical type curve of the injection and confining horizons in the Reed City Dolomite from the Grey 1-31, located in the NW/4NW/4 Section 31, which is in the same section of the proposed injection location; and

(13) The porosity of both the injection and confining intervals as determined from well log analysis and core observations; also shown below for ease of reference, and



	Zone	Footage	Porosity	Permeability	Description
Confining	Bell Shale		0	0	Limestone, buff grey brown, f-micro crystaalin, argolicous, dololithic with grey shale
Confining	Dundee Limestone	60'	0-2%	<.1 md	Limestone, buff grey-brown, fine microcrystaline.
Confining	Reed City Anhydrite	10'	0	0	Anhydrite
Injection	Reed City Dolomite	150'	5-7%	50-100 md	Dolomite, brown, hard, medium to fine crystaline, succroustic, small sl argilicous, good inter crystaline porosity
Confining	Detroit River Anhydrite	60'	0	0	Minor dolomite, brown dark brown anhydrite with small brown limestone and grey-black shale. Anhydrite, white grey.

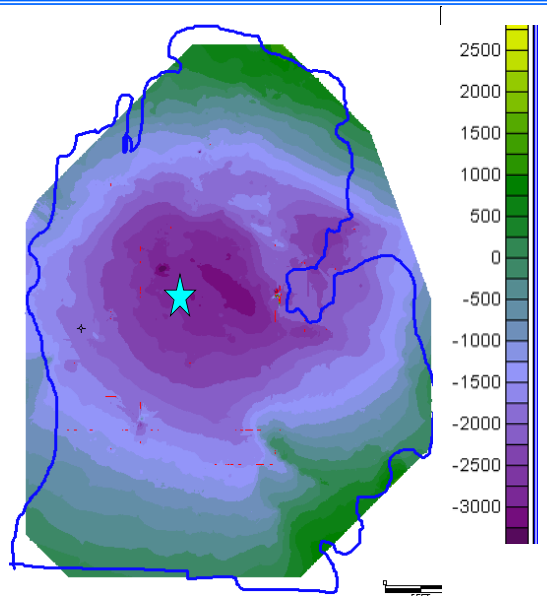
(14) The real observed and determined permeability from extensive drill stem analysis and step fall-off tests as performed and reported immediately in the AOR; and

(15) Real lithologic descriptions as observed by the wellsite geologist when drilling through the Freudenberg 1-31, located in the NE/4NE/4 Section 31, which is in the same section of the proposed injection location; and the Grey 1-31.

The Reed City Anhydrite, the micro-crystalline limestone of the Dundee Formation, and the Bell Shale have virtually no porosity or permeability and serve as excellent confining layers above the Reed City Dolomite.

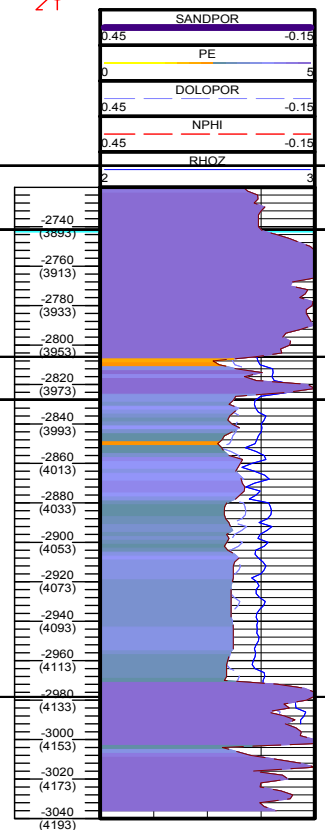
Michigan Potash Operating, LLC

Reed City Dolomite Injection and Confining Interval Detail



Dundee Structure Map, Subsea Depth

GRAY
1-31
T17N R8W S31



	Zone	Footage	Porosity	Permeability	Description
Confining	Bell Shale		0	0	Limestone, buff grey brown, f-micro crystaalin, argolicous, dololithic with grey shale
Confining	Dundee Limestone	60'	0-2%	<.1 md	Limestone, buff grey-brown, fine microcrystaline.
Confining	Reed City Anhydrite	10'	0	0	Anhydrite
Injection	Reed City Dolomite	150'	5-7%	50-100 md	Dolomite, brown, hard, medium to fine crystaline, succroustic, small sl argilicous, good inter crystaline porosity
Confining	Detroit River Anhydrite	60'	0	0	Minor dolomite, brown dark brown anhydrite with small brown limestone and grey-black shale. Anhydrite, white grey.

Measured Permeability In AOR

REED CITY DOLOMITE POROSITY AND PERMEABILITY

WELL	THICKNESS POROSITY	UNCORRECTED LIMESTONE POROSITY (%)	MEASURED PERMEABILITY (MILLIDARCIES)
Johnson 1-1	147	3.69	< 1
McClain 1-28	140	.4.365	7 *
Pilarski 1-12	140	5.6425	166
Ward 1-11	154.5	7.0925	250 **
Grein 2-36	156	8.64	- ***
Compton 1-13	156	10.0325	244 ****
Woodward 1-26	150	5.65	86.5*****
Thomas 1-26	164	5.65	86.5*****

*/ Drill stem test included 2 feet of porous Dundee Formation above the Reed City Dolomite.
**/ Calculated 362 md. Plots do not permit high precision, reduced to 250 md to be conservative.
***/ Drill stem test unreliable due to tool leakage.
****/ Drill stem test included 14 feet of porous Dundee Formation above the Reed City Dolomite.
*****/As reported on Class I Non Hazardous Re-applicaton from Step Rate Tests

Figure F8. Showing (1) a geophysical type curve of the injection and confining horizons in the Reed City Doloimite from the Grey 1-31, located in the NW/4NW/4 Section 31 (2) the calculated porosity (3) the real observed and determined permeability from extensive drill stem analsyis and step fall-off tests as performed and reported immediately in the AOR (4) a structure map of the top of the Dundee Limstone in the entire state, as it relates to the AOR (5) real lithologic descriptions as observed by the wellsite geologist when drilling through the Fruendenberg 1-31, located in the NE/4NE/4 Section 31.

Above the Belle Shale are multiple, tight, dense limestones, shales, and anhydrites, including the Antrim Shale, Ellsworth Shale, Sunbury Shale, and the Coldwater Shale for another approximate 3,000 before any USDW is encountered.

- **Figure F9** is a cross section through the AOR, showing the geological units of interest and their immediate confining layers from West to East. The AOR is in an a structurally undisturbed area, with regional dip less than 1 degree. There are no observable faults in the AOR.

- **Figure F10** shows the USDWs in relation to the proposed injection zones in the immediate proximity of the AOR. This cross section is intentionally shown on a 1:1 ratio, with no vertical exaggeration. This is for the purpose of illustrating the amount of interlayered and non-permeable intervals between any potential injection zone and any potential USDW.

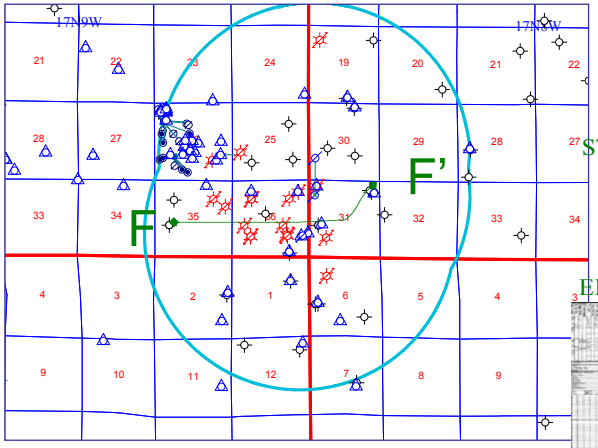
The flat, undisturbed, structurally quiet, geological character of the AOR can be observed in Figure F9 through Figure F13. There is little to no structure; no tectonics and no known faults in the AOR. The regional dip is less than 50' per 1 mile.

- **Figure F11** is a structure map of the Bass Island Group.

- **Figure F12** is a structure map of the of the Sylvania Sandstone.

- **Figure F13** is a structure map of the Reed City Dolomite.

- **Figure F14** is a 8 ½ x 11" diagram showing well construction and corresponding site stratigraphy for the MPC 1D, MPC 2D, and MPC 3D.



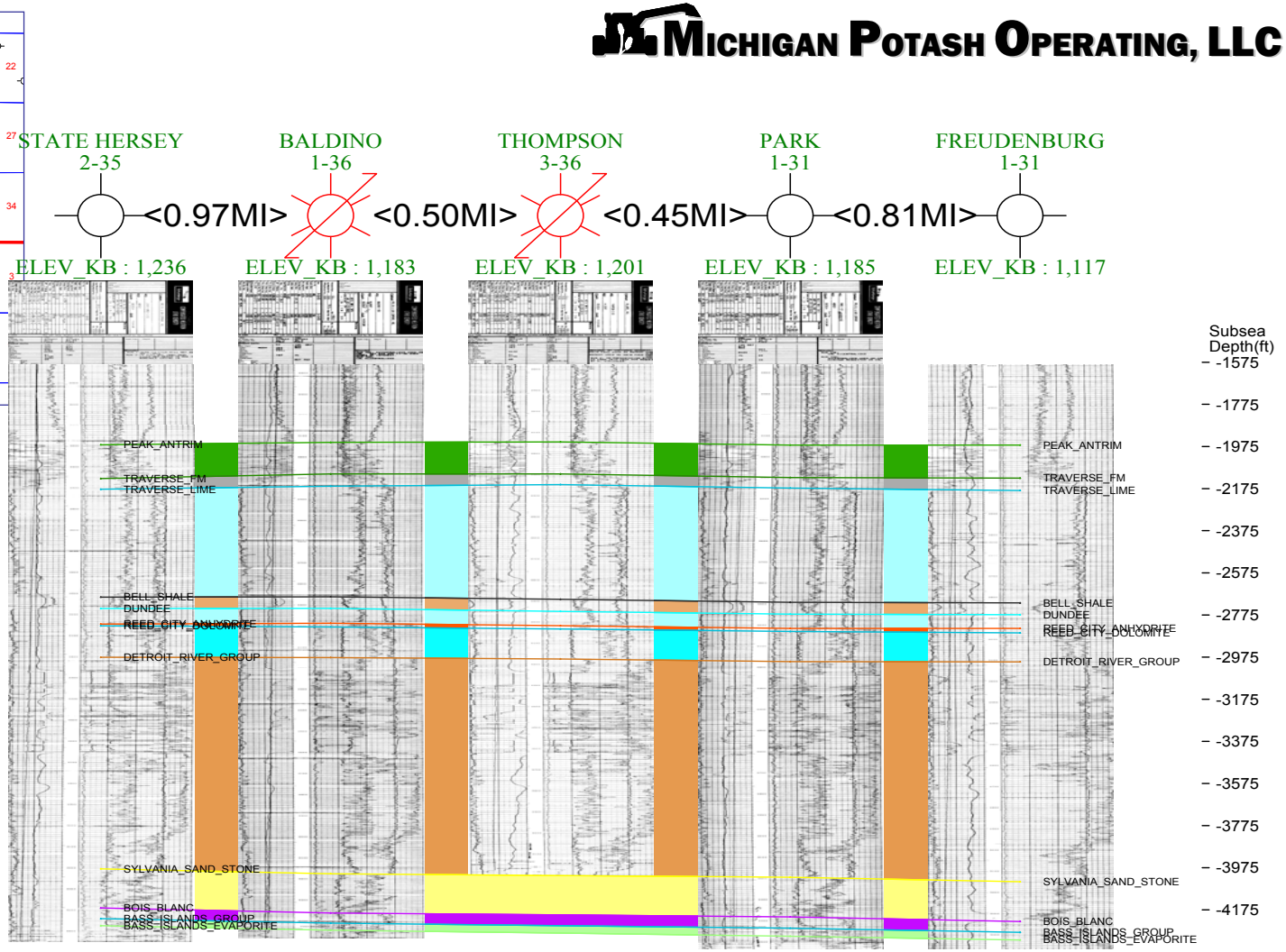


Figure F9 is a cross section through the AOR, showing the geological units of interest and their immediate confining layers from West to East. There are no observable faults in the AOR.

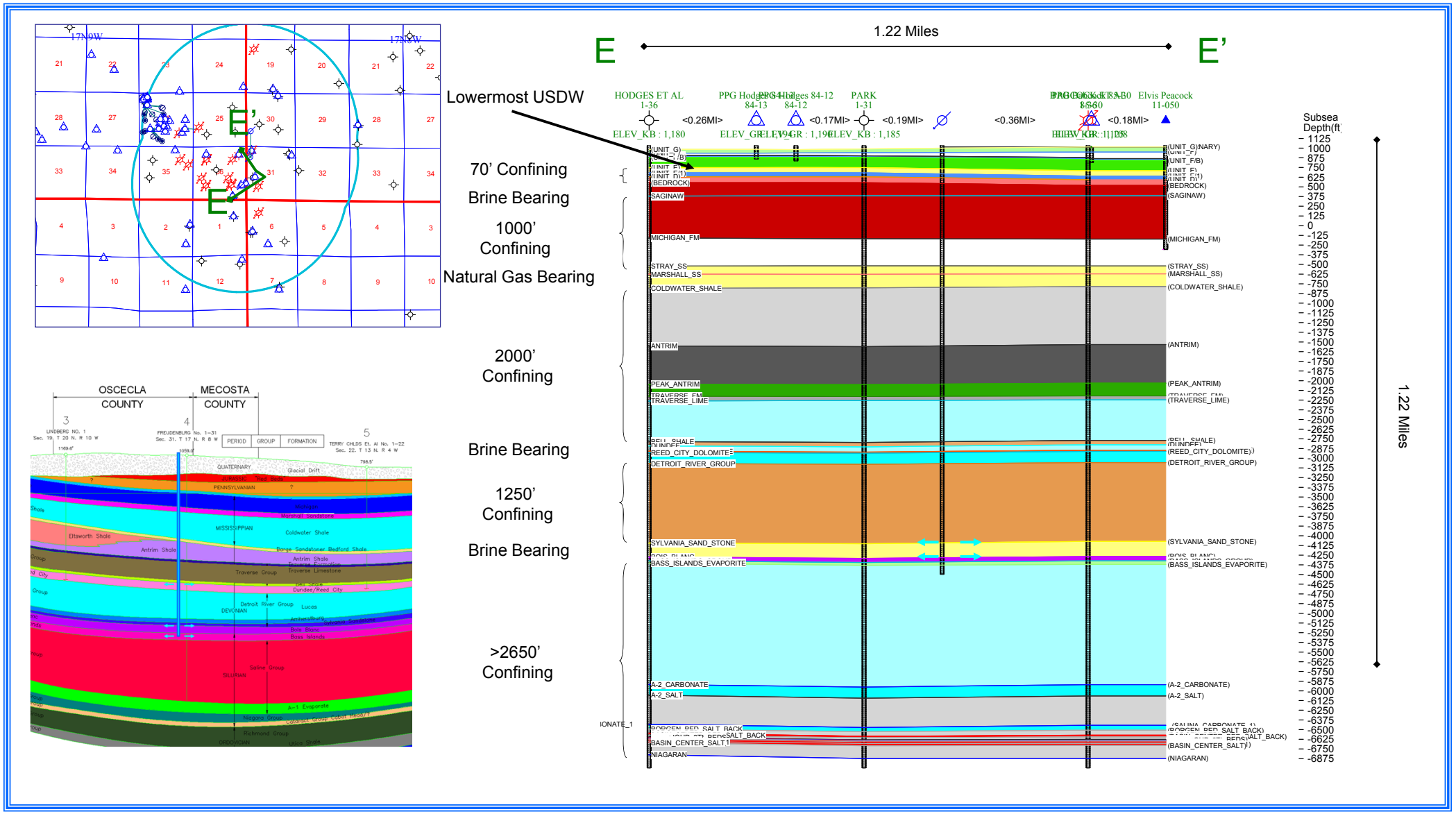


Figure F10 shows the USDWs in relation to the proposed injection zones in the immediate proximity of the AOR. The larger cross section is intentionally shown on a 1:1 ratio, with no vertical exaggeration to illustrate the amount of inte-rlayered and non-permeable intervals between any potential injection zone and any potential USDW.

MICHIGAN POTASH OPERATING, LLC

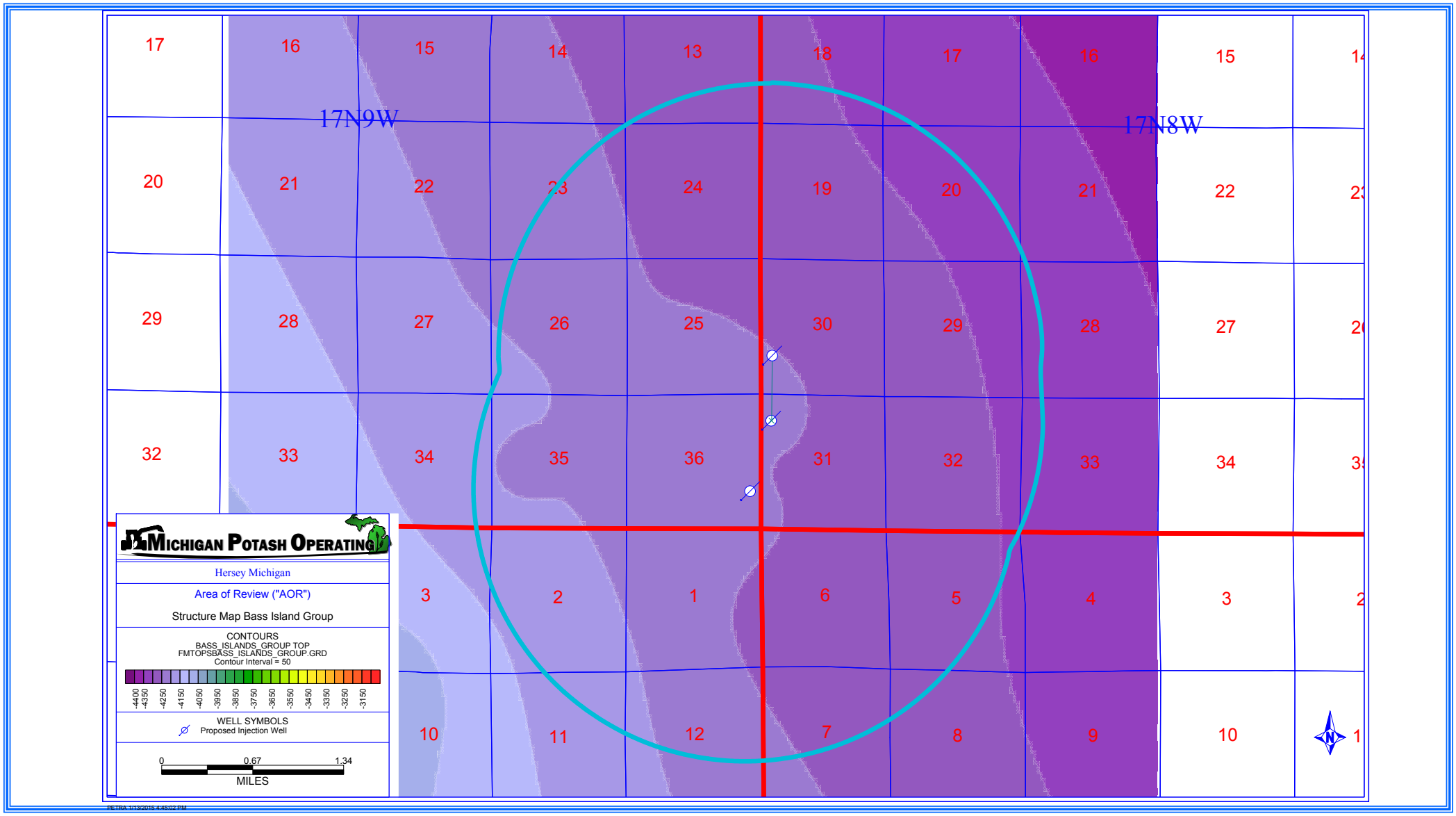


Figure F11. A structure map of the Bass Island Group.

MICHIGAN POTASH OPERATING, LLC

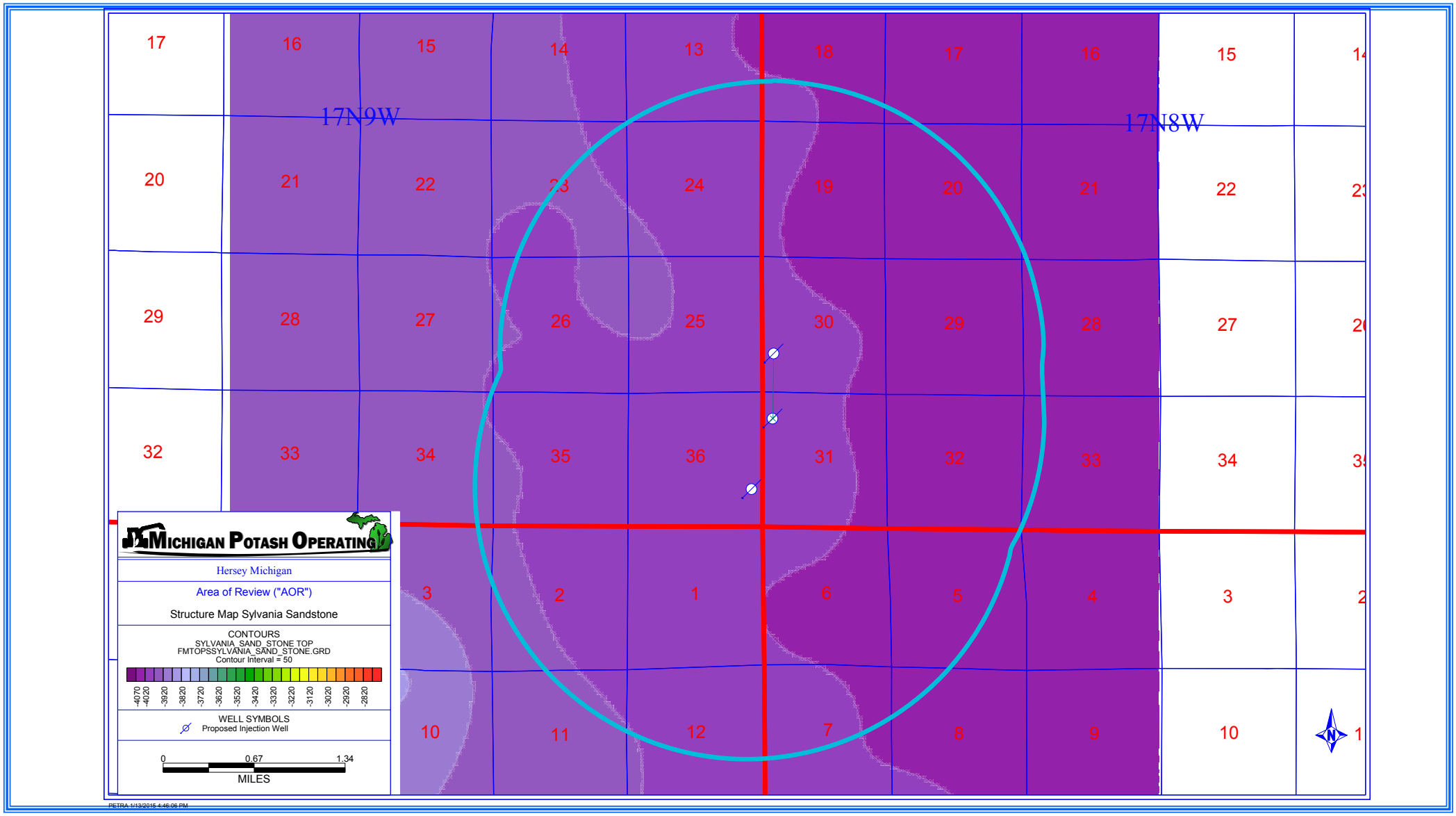


Figure 12. A Structure map of the Sylvania Sandstone

Michigan Potash Operating, LLC

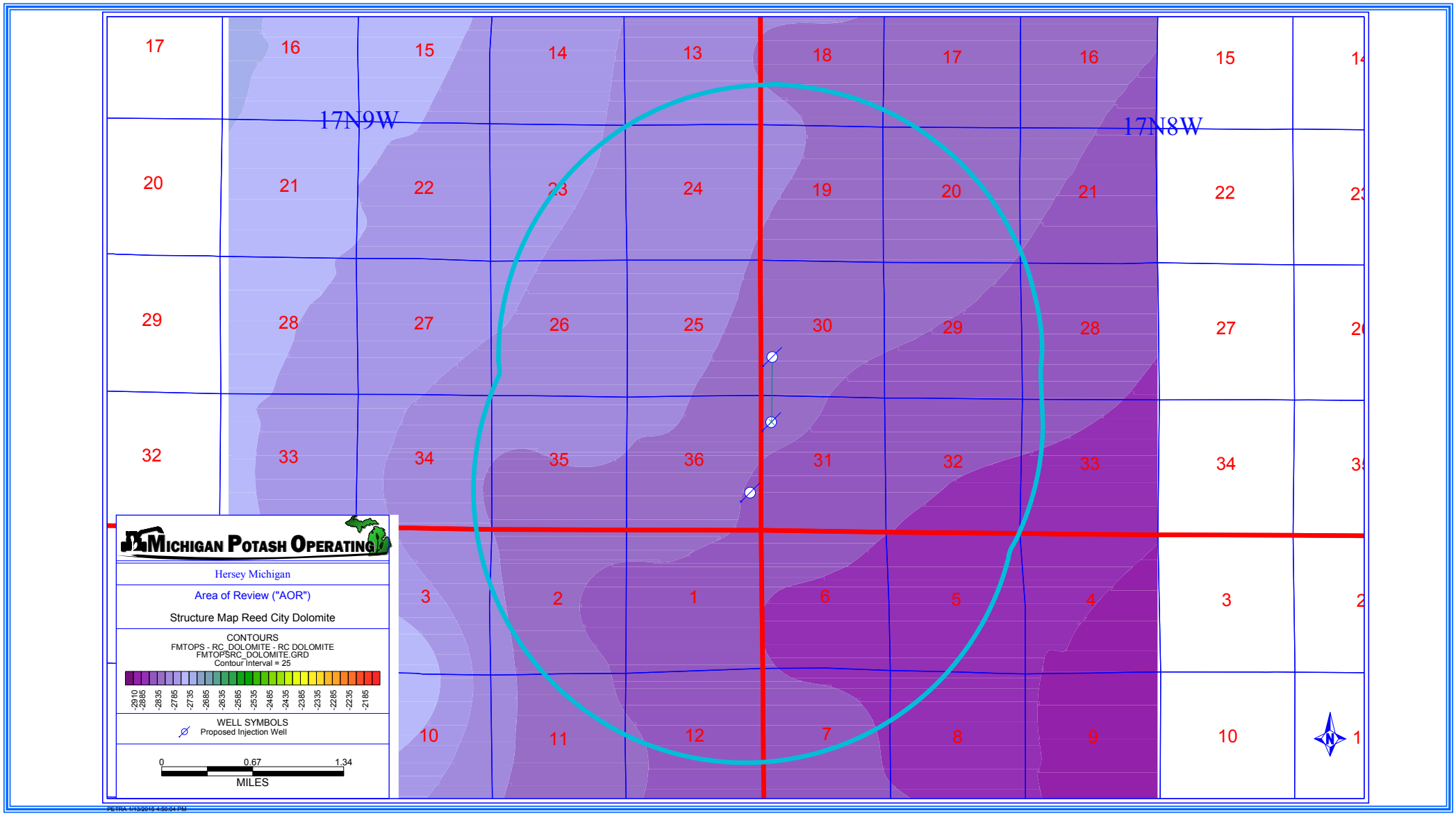


Figure F13. A structure map of the Reed City Dolomite.

Michigan Potash Operating, LLC

MPC 1D

SURFACE: NW/4 SEC 31, T17N R08W, 43.825947, -85.323008

VERTICAL WELL

OSCEOLA COUNTY, MI

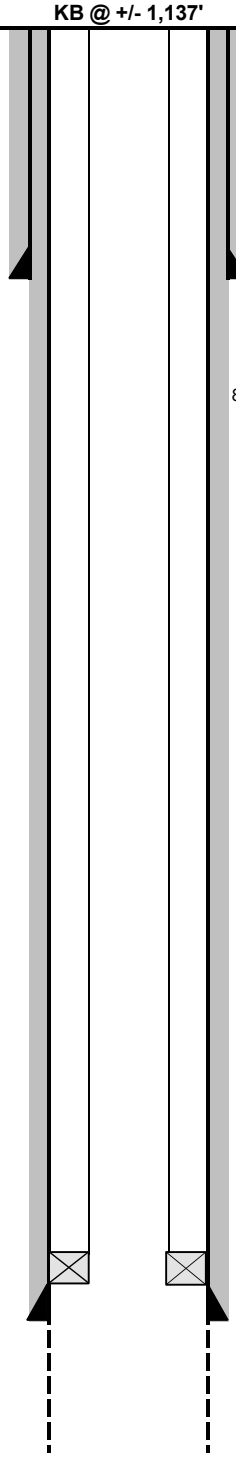
PROPOSED WELLBORE DIAGRAM

GL @ +/-1,124'

KB @ +/- 1,137'

UPDATED JAN 2015 BY TAP

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	0	0
Quaternary F1	59	59
Quaternary F	138	138
Quaternary E	323	323
Quaternary E/1	393	393
Quaternary D	439	439
Jurrasic Red Beds	513	513
Pennsylvantian		
Michigan	1205	1205
Marshall Sandstone	1653	1653
Coldwater Shale	1818	1818
Antrim Shale	2565	2565
Traverse Formation	3228	3228
Bell Shale	3802	3802
Dundee/Reed City	**3858**	**3858**
Detroit River Group	4088	4088
Amherstburg	4962	4962
Sylvania Sand Stone	**5105**	**5105**
Bois Blanc	5300	5300
Bass Islands Group	**5355**	**5355**



17 1/2" HOLE

SURFACE CASING

13-3/8" 54.5# J-55

SET @ 800'

Cement to Surface

320 SX 50/50 Poz and Lite, 1.47 Yield

8 3/4" HOLE DRILLED TO 5,500' (5,500 TVD)

Production String

4.5# 11.6-15.5 L-80

Arrow Set 10K 7" Packer at +/- 5050' MD

Set in Compression

Annulus fluid is inhibited brine, +/- 1.1-1.2 SG

PRODUCTION CASING

7" 23-38# N-80

SET @ 5,160' MVD, TVD

BASE of AMHURSTBURG

DV Tool @ 3,500'

Cement from Shoe to Surface

Stage 1: 240 SX 50/50 Poz-Class A, 1.24 Yield

Stage 2: 430 SX 14.2 LITE, 1.47 Yield

LINER HANGER AT +/ - 5,100'

SLOTTED LINER BELOW CASING SHOE

TO TD AT +/- 5,550

PBTD = TD

TD @ +/- 5,550'

FIGURE F14.

MPC 2D

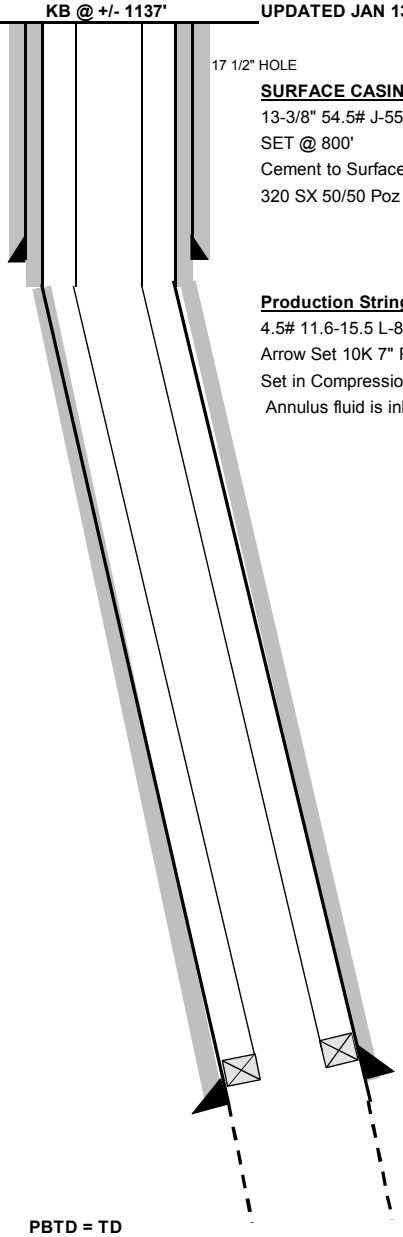
SURFACE: NW/4 SEC 31, T17N R08W, 43.825948, -85.322932
BOTTOM: SW/4 SEC 30, T17N R08W, 43.832871, -85.322873
OSCEOLA COUNTY, MI

PROPOSED WELLBORE DIAGRAM

GL @ +/-1,124'
KB @ +/- 1137'

UPDATED JAN 13, 2015 BY TAP

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	117	117
Quaternary F1	165	165
Quaternary F	196	196
Quaternary E	342	342
Quaternary E/1	410	410
Quaternary D	461	461
Jurrasic Red Beds	537	537
Pennsylvantian	706	706
Michigan	1261	1317
Marshall Sandstone	1719	1836
Coldwater Shale	1893	2034
Antrim Shale	2653	2897
Traverse Formation	3296	3626
Bell Shale	3889	4299
Dundee/Reed City	**3945**	**4363**
Detroit River Group	4170	4618
Amherstburg	4962	5517
Sylvania Sand Stone	**5194**	**5718**
Bois Blanc	5383	5995
Bass Islands Group	**5437**	**6057**



17 1/2" HOLE

SURFACE CASING
13-3/8" 54.5# J-55
SET @ 800'
Cement to Surface
320 SX 50/50 Poz and Lite, 1.47 Yield

Production String
4.5# 11.6-15.5 L-80
Arrow Set 10K 7" Packer at +/- 5600' MD
Set in Compression
Annulus fluid is inhibited brine, +/- 1.1-1.2 SG

PRODUCTION CASING
7" 23-38# N-80
SET @ 5,700' MVD, 5,185' TVD
BASE of AMHURSTBURG
DV Tool @ 3,500' TVD, 3,858', MD
Cement from Shoe to Surface
Stage 1: 270 SX 50/50 Poz-Class A, 1.24 Yield
Stage 2: 473 SX 14.2 LITE, 1.47 Yield

LINER HANGER AT +/ - 5,600' MD
SLOTTED LINER BELOW CASING SHOE
TO TD AT +/- 6,130 MD

PBTD = TD
TD @ +/- 5,550' TVD, 6,130 MD

FIGURE F14.

MPC 2D

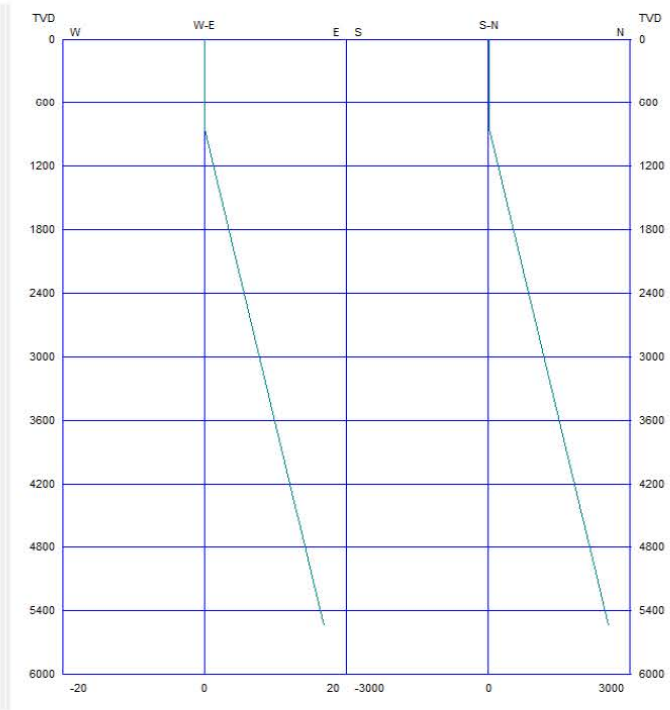
SURFACE: NW/4 SEC 31, T17N R08W, 43.825948, -85.322932

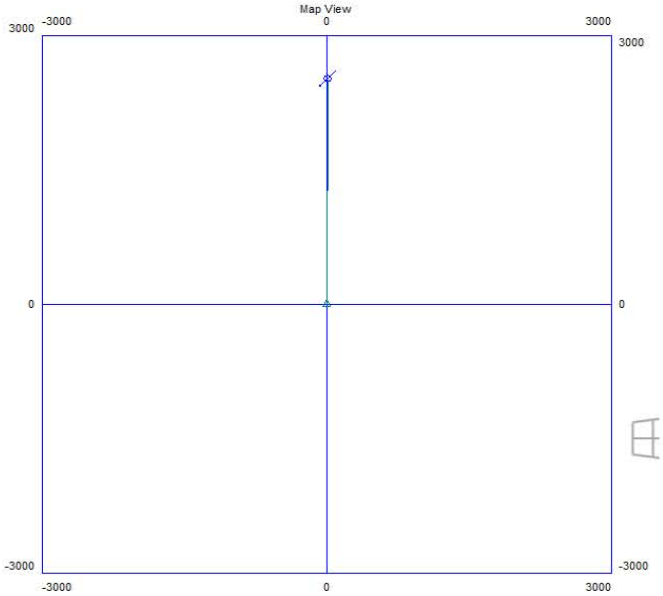
BOTTOM: SW/4 SEC 30, T17N R08W, 43.832871, -85.322873

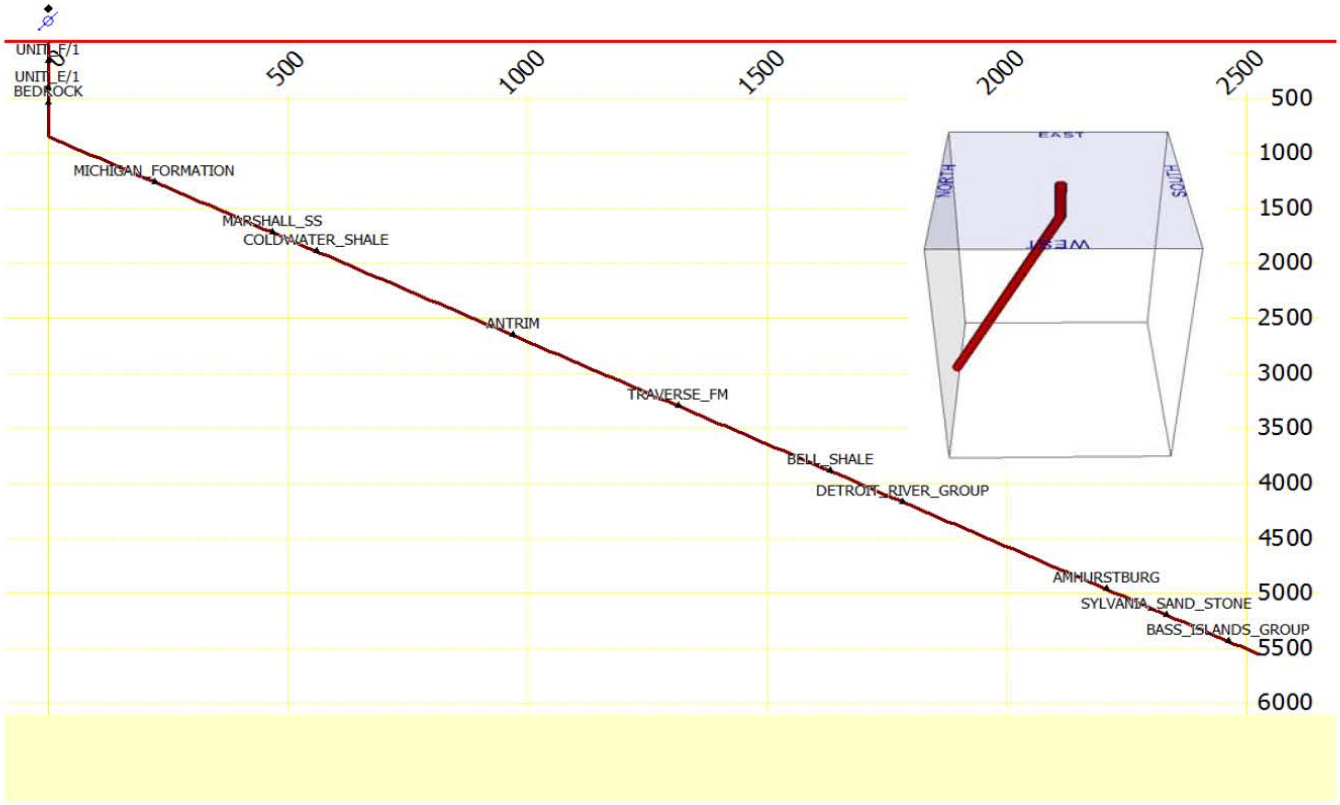
OSCEOLA COUNTY, MI

SURVEY DATA

GL @ +/-1,124'







MPC 3D

SURFACE: NW/4 SEC 31, T17N R08W, 43.818448, -85.326073

VERTICAL WELL

OSCEOLA COUNTY, MI

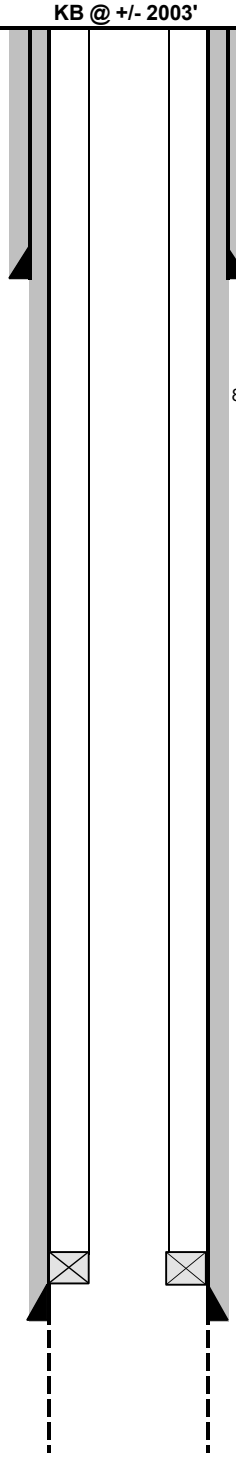
PROPOSED WELLBORE DIAGRAM

GL @ +/-1,190'

KB @ +/- 2003'

UPDATED JULY 11Th 2014 BY TAP

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	117	117
Quaternary F1	165	165
Quaternary F	196	196
Quaternary E	342	342
Quaternary E/1	410	410
Quaternary D	461	461
Jurrasic Red Beds	537	537
Pennsylvantian	706	706
Michigan	1261	1261
Marshall Sandstone	1719	1719
Coldwater Shale	1893	1893
Antrim Shale	2653	2653
Traverse Formation	3296	3296
Bell Shale	3889	3889
Dundee/Reed City	**3945**	**3945**
Detroit River Group	4170	4170
Amherstburg	5019	5019
Sylvania Sand Stone	**5194**	**5194**
Bois Blanc	5383	5383
Bass Islands Group	**5437**	**5437**



17 1/2" HOLE

SURFACE CASING

13-3/8" 54.5# J-55

SET @ 800'

Cement to Surface

320 SX 50/50 Poz and Lite, 1.47 Yield

8 3/4" HOLE DRILLED TO 5,500' (5,500 TVD)

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Annulus fluid is inhibited brine, +/- 1.1-1.2 SG

PRODUCTION CASING

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BASE of AMHURSTBURG

DV Tool @ 3,500'

Cement from Shoe to Surface

Stage 1: 240 SX 50/50 Poz-Class A, 1.24 Yield

Stage 2: 430 SX 14.2 LITE, 1.47 Yield

LINER HANGER AT +/ - 5,100'

SLOTTED LINER BELOW CASING SHOE

TO TD AT +/- 5,550

PBTD = TD

TD @ +/- 5,550'

FIGURE F14.

F.3 USEPA Region V Checklist Items

- **Cross-section and structural contour maps adequate to describe the regional geology of the area including especially any faults**

  Please refer to attached Figures F3, F6-F13.
  There is no indication of faulting within the region.

- **Cross-sections of site-specific geology including any faulting in the AOR**

  Please refer to attached Figures F3, F6-F13.
  There is no indication of faulting within the AOR.

- **Geologic description of the confining zone (including lateral extent, lithologies, thickness, permeability's, porosities, extent of natural or induced fractures, etc.)**

  Please refer to Figures F6-F8.
  There is no documented evidence of any natural or induced fractures in the area.

- **Geologic description of the injection zone (including depth, lateral extent, lithology, thickness, permeability, porosity, presence of natural or induced fractures, etc.)**

  Please refer to Figures F6-F8.
  There is no documented evidence of any natural or induced fractures in the area.

- **Diagram showing well construction and corresponding site stratigraphs**

  Please refer to Figure F14.

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT H: OPERATING DATA

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHMENT H.
OPERATING DATA

EPA instruction, form 7520-6 (2011):

OPERATING DATA - Submit the following proposed operating data for each well (including all those to be covered by area permits: (1) average and maximum daily rate and volume of the fluids to be injected; (2) average and maximum injection pressure; (3) nature of annulus fluid; (4) for Class I wells, source and analysis of the chemical, physical, radiological and biological characteristics, including density and corrosiveness, of injection fluids; (5) for Class II wells, source and analysis of the physical and chemical characteristics of the injection fluid; (6) for Class III wells, a qualitative analysis and ranges in concentrations of all constituents of injected fluids. If the information is proprietary, maximum concentrations only may be submitted, but all records must be retained.

H.1 Average and Maximum Daily Rate and Volume of Fluids to be Injected

At any given time, disposal may occur to a single well or to all applicant wells simultaneously, thereby reducing or changing the injected rate and volume per well. Maximum instant rates and volumes are not expected to exceed the following, per well. It is more likely than not, than injection pressures, or injection volumes will be the limiting threshold.

Average Rate	Maximum Rate	Average Volume	Maximum Volume
Gpm	gpm	gpd	gpd
175	600	252,000	864,000

H.2 Average and Maximum Injection Pressures

All proposed injection zones are under-pressured in the area, with an anticipated pore pressure gradient of 0.41 psi/ft or less. In the state of Michigan, intermediate casing is typically set across the Bass Island Group as a result of lost circulation. Open hole logs suggest good injectivity across all proposed injection horizons.

Step rate and fracture data will be gathered for the target injection horizons in the subject wells.

From Deepest to Shallowest:

The Bass Island Formation underwent extensive injectivity and step rate analysis via Class V CO2 injection wells to the north. Bottom hole injection pressures never exceeded 2000 psi (0.58 psi per foot) despite injecting at rates in excess of 150,000 gpd ("Well test results and reservoir performance for a carbon dioxide injection test in the Bass Islands Dolomite in the Michigan Basin").

Sylvania Sandstone injection pressures in the state of Michigan approximate 500-900 psi, and are well established in Michigan.

Reed City Dolomite injection in the AOR over the previous ten years of operation demonstrates an average injection pressure into the Reed City Dolomite of 900 psi. This is reported regularly and summarized in re-application permits by the owner and operator of MI-133-1I-0002 and MI-133-1I-0001. These wells are injecting into the same Reed City Dolomite horizon as is proposed by Michigan Potash Operating. It is logical and expected that similar rates and pressures will be observed. MI-133-1I-0002 and MI-133-1I-0001 have under gone fracture testing in the AOR in the Reed City Dolomite.

Injection tests were made by pumping treated water in the Reed City Dolomite at rates up to 1,176 gallons per minute at a surface pressure of 2,960 psi. After deduction of calculated friction loses of 38 psi within the well, the pressure at the top of the Reed City Dolomite, while injected treating fresh water was 4,647 psi. No parting or fracturing of the formation was noted, indicated the fracture pressure must be greater than 4,647 psi. A pressure gradient of 1.18 psi per foot was calculated. No further attempts were made to facture the injection zone.

This is typical of the Dundee, which has fracture gradients in typically in excess of 1.10 (1992-1993 Field Rules Final Fracture Pressure Gradients).

The permitted maximum injection pressure for the Thomas 1-26 well is 2,533 psi. The maximum injection pressure has been set by permit at 2,576 psig for the Woodward 1-26. Both are in the immediate vicinity of the applicant wells, into the same horizon, and up structure.

Based on available data, the following operating pressures are expected.

Average Pressure psi	Maximum Pressure psi
900	2,580

Injection fluid may be water (specific gravity of 1.0) or a partially saturated sodium chloride/potassium chloride brine solution with a specific gravity of 1.2.

H.3 Nature of Annulus Fluid

The annulus fluid will be a corrosion inhibited brine, with a anticipated specific gravity of 1.1.

H.4 Source and analysis of the chemical, physical, radiological and biological characteristics, including density and corrosiveness, of injection fluids;

The waste stream injected into the proposed Class I Non Hazardous injection wells are non-hazardous brines (salt water) generated by the simple processing of food grade salt utilized on dinner tables across the world, Sodium Chloride (NaCl), i.e. table salt or "salt", and potassium chloride (KCl) "potash", which is a natural, food safe fertilizer, applied to staple crops for food generation and consumption.

Salt and potash brine is sent to a natural gas fired evaporator, which concentrates the salt and potash water. The concentration of the water, crystallizes the salt from solution, and increases the concentration of the potash in the water. The water is then sent to potash crystallization processes, where temperature contrasts crystallize the potash from the water. The remaining water is recycled back for injection, or in the case of excess water, is sent to Class I wells.

The facility is a food grade facility, and therefore, no hazardous, or non-naturally occurring materials are introduced into the system.

There may be traces of sodium hydroxide, that is used in stripping naturally occurring H_2S from the brine that comes from the salt and potash bearing formation (Salina A1). Pump packing seal water (<10gpm), and a bleed system (<10gpm) containing some sodium bisulfite may be added to the injection stream.

Biological Characteristics:

The injection water from food grade salt and potash is essentially free of biological matter. Groundwater used in the food grade salt and potash process may contain trace, naturally occurring biological matter; however, the high salinity of the disposal fluid would cause an overall decline in biological matter content.

Radiological Characteristics:

The disposal fluid will contain trace amounts of the naturally occurring stable Cl 37 isotope and radiogenic K40 isotope associated with potassium chloride and sodium chloride. These are naturally occurring traces and not harmful to people, animals, or plant life. Potash is intentionally placed on crops to increase health and growth. Sodium chloride is intentionally placed in food sources.

H.5 A Representative Waste Analysis (including all major constituents and, for hazardous wastes. all hazardous constituents and characteristics)

Fluid disposed of in the wells, resulting from the solution processing of food grade salt and potash is comprised predominantly of only naturally occurring sodium chloride (NaC1) and naturally occurring potassium chloride (KC1).

Concentrations of these predominant compounds vary during the course of operations. At times, the disposal fluid will be very dilute with respect to KC1 and NaC1; at other times the disposal fluid will contain higher concentrations of KC1 and NaC1. The following is a typical representation on the physical properties and chemical characteristics of the waste brine.

	Range	Typical
Specific Gravity	1.0 - 1.2	1.10
pH	5.5 - 8.0	7.0

Chemical Characteristics:

Component	Weight Percent
H_2O	variable
NaC1	variable
KC1	variable
SO_4	<0.4
Br	<0.2
Ca	<0.2
Mg	<0.02

H.6 Plans for Corrosion Monitoring (if the waste is corrosive)

The injection stream is not particularly corrosive, unless oxygen is introduced inadvertently into the process stream.

Corrosion coupons, and real time monitoring of oxygen content, will be utilized to monitor any potential corrosion associated with the injection fluids. Over 30 years of successful food grade salt and potash processing within the immediate area has led to an extensive knowledge of the appropriate selection of materials of construction and steps that need to be taken to prevent equipment wear and corrosion. The annulus fluid in each injection well will be composed of inhibited brine.

Injection pressures will be monitored real time via pressure transducers.

Pressure transducers on the annulus of each injection well will be monitored real time.

Each injection well will be equipped with continuously recording measurement devices to monitor the injection pressure, flow rate and volume, and the pressure on the annulus between the tubing and the long string of casing. All brine injection will be through the tubing. If leakage were to develop in the tubing string or packer as a result of corrosion, it will be detected by noting a rise in the annulus pressure.

It is intended that when possible, all injection lines will be above ground, insulated, and heat traced, rather than buried, which enables a more proficient daily monitoring of any potential leak and corrosion.

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT I: FORMATION TESTING PROGRAM

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHEMENT I.
FORMATION TESTING PROGRAM

EPA instruction, form 7520-6 (2011):
FORMATION TESTING PROGRAM - Describe the proposed formation testing program. For Class I wells the program must be designed to obtain data on fluid pressure, temperature, fracture pressure, other physical, chemical, and radiological characteristics of the injection matrix and physical and chemical characteristics of the formation fluids.

For Class II wells the testing program must be designed to obtain data on fluid pressure, estimated fracture pressure, physical and chemical characteristics of the injection zone. (Does not apply to existing Class II wells or projects.)

For Class III wells the testing must be designed to obtain data on fluid pressure, fracture pressure, and physical and chemical characteristics of the formation fluids if the formation is naturally water bearing. Only fracture pressure is required if the program formation is not water bearing. (Does not apply to existing Class III wells or projects.)

I.1 Procedures to verify depth of lowermost USDW:

Over 308 hydrological test holes and approximately 60 piezometers cataloging over 33,833 feet of groundwater and soil data was amalgamated for the purposes of adequately understanding and protecting groundwater within the Michigan Potash Operating AOR, specifically to the proposed area of injection, including detailed geological cross section and a subsurface understanding of the deposits and the water they contain.

The proposed injection wells are being drilled immediately within the vicinity of well mapped depths of the USDW.

A cross section across all proposed injection wells has been developed, in expectation of the depths at which the USDW will occur. Therefore, the approximate depth, within +/- 10' can be predetermined before drilling the proposed injection wells.

Figure D4 through Figure D10 have been generated for the sole purpose of identifying the lowermost USDW before drilling commences.

The proposed injection wells are surrounded by control wells in all four directions. **Figures D5 through D8** are cross sections showing the anticipated depths of the Quaternary aquifer sources, including the lower most USDW.

Further while drilling, the following procedures shall be followed to verify the lowermost USDW:

1. While drilling with fresh water system to the surface casing point: A) monitor all returns B) grab samples every 50' from 0 to 600' and bag. Watch for Jurassic Red-Bed cuttings to return to surface at +/- 550' measured depth. Following red beds and cutting samples until bedrock is verified.

It is regulatory standard to drill adequately below the bedrock before setting surface casing.

I.2 Procedures to obtain extrapolated formation pressure in porous and permeable zones within approximately 500 feet of the top of the injection zone (non-hazardous wells) or injection interval (hazardous wells):

As per **Figure F9**, there are virtually no porous or permeable intervals until 4,650', which is 520' above the Sylvania Sandstone, the top of the proposed injection horizon and outside of the EPA guidance. The interval that does occur is a 10' dolomite in the Detroit River Group, which contains sour oil and sour gas, with higher TDS and naturally occurring constituents than the injection fluid.

Also as per **Figure F9**, there are virtually no porous or permeable intervals within 500' of the top of the Reed City Dolomite. The closest porous interval occurs above the Antrim and Coldwater Shale, at 1600' below ground level, which is 2,350' above the Reed City Dolomite, the shallowest proposed injection horizon. This is the Marshall Sandstone, which is a natural gas bearing, high TDS, salty brine interval that has been a natural gas producing interval in the AOR, and is a historical disposal horizon (Figure F4).

As per **Figure B1-B4**, there are over 70 well control points in and just outside of the AOR, making the geological control and pressure information over the AOR extensive.

The DSTs graphically summarized in **Figure F8** have indicated a reservoir pressure in the range of 1,600-1,700 psi in the Reed City Dolomite. This equates to a under-pressured gradient 0.41 psi/foot depth. The Bass Island and Sylvania Sandstone also tend to be under-pressured; hence the statewide practice of setting of intermediate casing once the Bass Island Dolomite has been drilled through before proceeding deeper.

Figures F6-F8 shows analysis of each of the injection horizons via direct core and interval measurements as it relates to the injection horizons in the AOR.

Average horizontal permeability to fluid ranges from 10 to over 250 millidarcies in the more favorable areas of Injection. Drill stem tests have yielded up to 3,300 feet of formation fluid, with most of the flow occurring in the first 15 minutes in wells having very good porosity and permeability. Average permeability grades downward to low values in the eastern portion of the detailed study area.

I.3 Sampling and analysis procedures for formation fluid of: 1) the first aquifer overlying the confining zone (hazardous and non-hazardous wells); 2) the injection zone (non-hazardous wells) or injection interval (hazardous welts); and 3) the containment interval (hazardous wells only).

1) As per section D.4 and I.2, there are no aquifers overlying any of the confining zones that warrant individual testing as they are all highly saline, contain natural gas, sour gas, or oil.

Any porosity encountered above the injection horizons is sporadic, thin, and immediately interlayered with confining anhydrites, dolomites, cherts, or limestones, which will render data collection near impossible, impractical, or dangerous in the event of a proposed test of the Detroit River Group (FIGURE F9).

2) From deepest to shallowest, DSTs will be conducted across the Bass Island Dolomite, the Sylvania Sandstone, and the Reed City Dolomite.

The brine produced by the manufacturing of food grade salt and potash is cleaner than the existing fluid in the injection horizons. There are fewer constituents in the injection fluid, and similar concentrations of dissolved

solids, particularly chlorides. Historical laboratory experiments have been conducted to evaluate the compatibility of the fluids, and pre-established operation of long standing injection into all of the proposed injection horizons have never indicated any incompatibility.

From Deepest to Shallowest, legacy data from the proposed injection zones are as follows:

In the Bass Island Dolomite:

The Midwest Regional Carbon Sequestration Partnership successfully applied over 24 Million dollars, 18 million of which was via the Department of Energy, into the geologic and rock fluid capacities of the Bass Island Dolomite (http://www.mrcsp.org). The Bass Island Fluid Chemistry is as follows as follows:

Property	Result
pH	6.91
Color	light brown
Specific gravity	1.2275
Specific conductance	188,000 microohms/crn @ 25°C
Viscosity	18 centipoise @ 23°C

Constituent	Concentration
Calcium	58,500 mg/l
Magnesium	7498 mg/l
Potassium	8982 mg/l
Sodium	31,100 mg/l
Barium	2 mg/1
Boron	135 mg/1
Iron	1 mg/1
Manganese	6 mg/I
Silica	1 mg/1
Strontium	2130 mg/l
Bicarbonate	220 mg/l
Carbonate	<1 mg/1
Bromide	1744 mg/l
Chloride	203,400 mg/l
Fluoride	0.4 mg/1
Iodide	28 mg/1
Nitrate	<0.1 mg/1
Sulfate	198 mg/1
Total dissolved solids	365,000

In the Sylvania Sandstone:

The Sylvania Sandstone has long been utilized as a brine disposal formation. The Sylvania Sandstone Chemistry on average, is as follows:

Property	Result
pH	6.5
Color	light brown
Specific gravity	1.250

Constituent	Concentration
Sulfate	44 mg/l
Calcium	72,200 mg/l
Magnesium	53,100 mg/l
Potassium	8,000 mg/l
Sodium	31,100 mg/l
Barium	2 mg/l
Boron	333 mg/l
Rubidium	15 mg/l
Iodine	34 mg/l
Ammonium	398 mg/l
Total dissolved solids	410,000

The Sylvania Sandstone is saturated with a very briny formation fluid having over 400,000 mg/ liter total dissolved solids.

In the Reed City Dolomite:

A Reed City Dolomite fluid sample acquired from the Ward 1-11 in the AOR is summarized as follows:

Property	Result
pH	5.5
Color	light brown
Specific gravity	1,2118
Specific conductance	94,000 microohms/crn @ 25°C
Viscosity	18 centipoise @ 23°C

Constituent	Concentration
Dissolved CO2	132 mg/1
Dissolved Oxygen	0.1 mg/l
Sulfide as H2S	<30 mg/1
Calcium	3,9%
Magnesium	0.59%
Potassium	1.6%
Sodium	5.9%
Barium	8 mg/1
Boron	57.5 mg/1
Cadmium	0.2 mg/1
Iron	<10 mg/1
Manganese	2.7 mg/I
Silica	2.4 mg/1
Strontium	0.14%
Bicarbonate	220 mg/l
Carbonate	<1 mg/1
Bromide	0.16%
Chloride	19%
Fluoride	0.4 mg/1
Iodide	28 mg/1
Nitrate	<0.1 mg/1
Sulfate	210 mg/1
Oil content	74 mg/1
Suspended solids	0.6%
Total dissolved solids	27%

The Reed City Dolomite porosity is saturated with a very briny formation fluid having over 320,000 mg/ liter total dissolved solids.

Extensive historical injection into the proposed formations and associated compatibility tests on the proposed injection fluids and those naturally occurring in the injection horizons, with real observed injection histories and data have not suggested any expected incompatibility based on the reservoir fluids and the proposed injection fluids, which is simply chloride water.

1.4 Cores and laboratory core testing for confining and injection intervals (for non-hazardous waste wells, a minimum of one 30-foot core of the confining zone and one 30-foot core of the injection zone; for hazardous wells where injection of restricted waste is proposed, one or more cores of the confining interval).

Figures F6-F8 show the numerous core and laboratory testing performed on the injection and confining zones of interest. The length of the core and analysis thereof exceeds 30' in all cases. Porosity in all injection horizons has been extensively studied and mapped by Michigan Potash Operating by means of geophysical well log analysis, historical DST analysis, and core analysis.

Laboratory analyses of core taken from the Reed City Dolomite in the immediate AOR, and from the Sylvania and Bass Island dolomite, confirm the porosities determined from geophysical logs and the permeabilities determined from drill stem tests.

The Reed City Dolomite has core taken immediately in the AOR in two wells:

In the Boyd 1-10 well in Section 10, Grant Township, 16 feet of Reed City Dolomite core was recovered, starting at a point 14 feet below the base of the Reed City Anhydrite.

In the Bass 1-32 well in Section 32, Hersey Township, 36.5 feet of Reed City Dolomite core was recovered, starting 3 feet below the base of the Reed City Anhydrite.

No fissures or natural solution channels have been observed in the Reed City Dolomite from logs or in cores.

I.5 Determination of fracture closure pressure of the injection zone (non-hazardous wells) or injection interval (hazardous wells).

Fracture closure tests will be gathered in the Bass Island and Sylvania Sandstone and Reed City Dolomite.

As previously described in Section H.2, injection tests were made by pumping treated water into the Reed City Dolomite at rates to 28 bbls (1,176 gallons) per minute at a surface pressure of 2,960 psi. After deduction of calculated friction losses of 38 psi within the well, the pressure at the top of the Reed City Dolomite, while injecting treated fresh water, was 4,647 psi. No parting or fracturing of the formation was noted, indicating the fracture pressure must be greater than 4,647 psi. A pressure gradient of 1.18 psi per foot was calculated. No further attempts were made to fracture the injection zone.

The Bass Island Formation underwent extensive injectivity and step rate analysis via Class V CO2 injection wells, although outside of. Bottom hole injection pressures never exceeded 2000 psi (0.58 psi per foot) despite injecting at rates in excess of 150,000 gpd ("Well test results and reservoir performance for a carbon dioxide injection test in the Bass Islands Dolomite in the Michigan Basin"). Step rate and fracture data will be gathered for the target injection horizon in the subject wells.

Injection pressures in Midland County in the Sylvania Sandstone approximate 500-900 psi.

I.6 Injectivity/fall-off testing of injection zone/interval, including interference testing if multiple wells are proposed.

Pressure transient and injectivity, step rate data will be performed, while being witnessed by the EPA and/or MDEQ in all injection horizons.

The proximity of multiple wells enables the possibility of observation and interference testing. Therefore, while one well is undergoing a step rate injection test, or injection volume, the offset well will be utilized as an observation well, allowing additional information as it concerns the proposed injection horizons and injectivity. This can be done for all injection horizons provided proper planning once injection is established. The procedures for estimating reservoir reaction to injected fluid are made by determination of the porosity, permeability, thickness, extent, and pressure of the reservoir. Formation samples and cores, geophysical logs, and drill stem tests, and observation of pressures between two points enables a analysis of reservoir extent by comparing and deducing this data. Various equations and approaches have been developed. One such methodology is as follows:

Determination of Reservoir Pressure

$$Pr = Pe - \frac{2.42\ Qv\ Ei\ (-x)}{Kh}$$

$$Ei(x) = \int_{x}^{\infty} \frac{e^{-x}\ dx}{x}$$

$$X = \frac{0.00011\ Vv\ Cw\ (Re)^2}{KT}$$

This formula is derived from Darcy's Law with the variables defined as follows:

Pr	=	Instantaneous reservoir pressure at a given time and distance from the well bore
Pe	=	Original reservoir pressure
Q	=	Flow rate
v	=	Viscosity
K	=	Permeability
h	=	Thickness of disposal zone
0	=	Average effective porosity of disposal zone
Cw	=	Compressibility coefficient
T	=	Elapsed time

The permeability is found by using the following version of the Horner method:

$$K = 162.6\ \frac{Qv}{m}\ \text{where m = cycle pressure mh}$$

There is also legacy data available within the AOR for Non-Hazardous Class I wells currently injecting in the into the Reed City Dolomite, which is summarized below, in expectation that measurements at the proposed locations may be similar. The following is a summary of data from reports issued in 2005 and 2006;

	Woodward 1-26	
Parameter	2005	2006
Permeability (k)	410 md	516.7 md
Perm-thick product (kb)	61,090 md-ft	76,988 md-ft
Skin factor (s)	16.4	2.27
Pressure change due to skin (Δp_{skin})	158.9 psi	29.22 psi
Flow efficiency (E)	0.36	0.80

Results of the pressure transient testing indicated the Woodward 1-26 well is positioned between parallel no-flow boundaries. A radial flow model with the Woodward 1-26 well positioned between parallel no-flow boundaries was utilized to evaluate the pressure transient data.

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CLASS I

ATTACHMENT J: STIMULATION PROGRAM

THE UNITED STATES POTASH PROJECT
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J. STIMULATION PROCEDURE

There is no anticipated breaking of the rock. The only stimulation of the proposed injection zone will be a natural completion, with simple, small HCl acid treatments to facilitate wellbore to reservoir communication:

Various concentration of HCl will be used based on the lithology of the proposed injection zone. Higher concentrations of HCl will be utilized for dolomite over sandstone.

- Pump 1,000 gallons of 7.5%-28% HCl into the well
- Pump 50 gallons of soap in the well if hydrocarbon plugging is suspected
- Pump 200 gallons of salt water with 500 pounds of rock salt diverter into the well
- Repeat first three bullet items as necessary
- Flush well with 2,000 gallons of salt water
- Test for well flow capability

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CLASS I

ATTACHMENT K: INJECTION PROCEDURES

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTCHEMENT K.
INJECTION PROCEDURES

EPA instruction, form 7520-6 (2011):

INJECTION PROCEDURES - Describe the proposed injection procedures including pump, surge, tank, etc.

K.1 Plant plan showing flow line of waste stream(s) to be injected

Figure K1 is an illustration of the proposed to build injection location. Each injection well will contain a facility such as this. The facility location will occupy no more than 4 acres more or less. Piezometric surfaces are shown to illustrate the proper placement of groundwater monitoring wells. The entire location is graded inward, over appropriate liners/gravel/cement for the purpose of storm water catch. Tertiary containment is included. Ground water monitoring wells are intentionally placed outside of the tertiary containment and shall be monitored and sampled according to the recommended sampling frequency as per the ground water monitoring plan as designed and implemented proactively despite being a Non-Hazardous facility. All lines will be above ground, insulated, and heat traced. There shall be no underground lines.

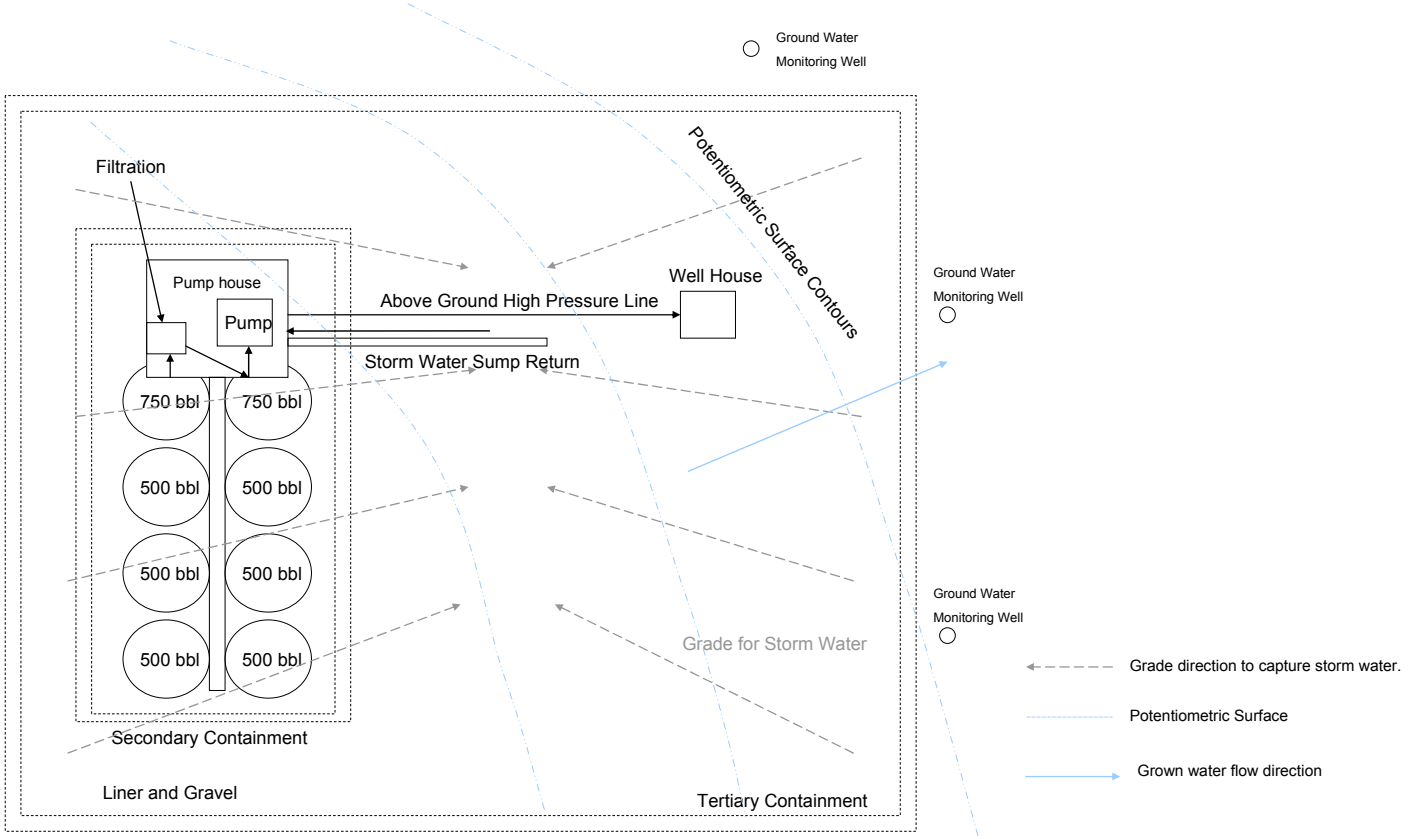

FIGURE K1. Proposed Plant Plan

K.2 Description of filters, storage tanks (including capacity), and any pretreatment processes and facilities, including location on plant plan

The filter shown in Figure K1 takes dirty, or unfiltered brine from the holding tanks as shown, and feeds it to a clean holding tank before injection. The filter may be a dual media (anthracite and sand), or alternative mechanical filtration. All tanks are internally resin coated carbon steel, some with external insulation. The 500 bbl tanks are 24H x 12W. The 750 bbl tanks measure 24H x 15.6W. The total capacity on location is 3500 bbls or 147,000 gallons. Secondary containment is designed accordingly.

K.3 Description of injection pumps, including rate capacity

Each well will have one injection pump. The pump will be a quintuplex or triplex positive displacement plunger pump, ranging between 184 and 267 hp, capable of between 636-660 gpm at approximately 5000-6000 psi. A pressure relief valve is used to prevent over pressure of the lines.

K.4 Description of annulus pressure maintenance system

Each well is equipped with a positive displacement pump to maintain the annulus pressure a minimum of 100 psi above the injection pressure. In the event of annulus pump failure, a replacement, portable pump is immediately available in the pump house. Temperature contrasts will be observed on a continuous basis so as to account for fluid temperature contraction and expansion.

K.5 Description of alarm and shut-off system

Pressure transmitters are to be used on all injection wells alarm for high injection pressure and low annulus pressure. Pumps are shut down manually if high injection pressure occurs. The annulus pump is used to manually increase annulus pressure if the annulus pressure drops to within 100 psi of the injection pressure. A pressure relief valve or rupture disc is used to protect surface and down hole equipment from over pressure.

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CLASS I

ATTACHMENT L: CONSTRCUTION PROCEDURES

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTCHEMENT L.
CONSTRUCTION PROCEDURES

EPA instruction, form 7520-6 (2011):

CONSTRUCTIONPROCEDURES -Discuss the construction procedures (according to §146.12 for Class I, §146.22 for Class II, and §146.32 for Class III) to be utilized. This should include details of the casing and cementing program, logging procedures, deviation checks, and the drilling, testing and coring program, and proposed annulus fluid. (Request and submission of justifying data must be made to use an alternative to packer for Class I.)

L.1 Detailed well construction procedures

Proposed Mud Program

Surface Hole (0' – 800' +/-): The surface hole drilling fluid will consist of an 8.4 - 9.0 ppg fresh water spud mud formulation with 28-36 viscosity units with fluid loss control as necessary to reach the base of the glacial till. Limit total solids to 4-6%.

Production Hole (800'+/- to TD 5,550'): The production hole drilling fluid will consist of a 9.0 – 9.6+ ppg water based mud system with 40-50 viscosity units and less than 25 fluid loss units. At +/- 4080, a low water loss system should be used to TD.

Drill Stem Tests

A DST in the Reed City Dolomite and
A DST in the Sylvania Sandstone and
A DST in the Bass Island Group.

Deviation Checks

Every 750' of drill depth a deviation survey shall be performed. More frequently if the deviation angle goes beyond the planned allowance.

Open Hole Logs

Surface Cashing: Resistivity, Spontaneous Potential, Caliper and GR.

Production Casing: Resistivity, Spontaneous Potential, Neutron Density, Compensated Formation Density, Gamma Ray, Caliper, Photo-Electric Effect, Multi-pad Micro Resistivity (i.e. Dip-meter-Fracture Finder), Borehole volume analysis

Cased Hole Logs

Surface Cashing: cement bond log, variable density log with collar locator, and temperature log

Production Casing: A state of the art, cement bond log variable density log, and collar locator will be run from total depth to surface. The depth of the casing is checked using a collar locator log to locate the marker joint. Before any injection commences, a baseline temperature log will also be run, so that comparative analysis can be performed following the commencement of injection.

Detailed Drilling Procedure

The proposed injection wells will be drilled and cased according to the following detailed construction procedure:

1. Line locate. Prepare footprint.
2. Provide 24 hour notice of move in rig up to all regional, State, and Federal authorities.
3. Report expected SPUD.
4. Permit will be on location at all times.
5. Drive 16" conductor to 100'.
6. Move in Rig Up Drilling Unit.
7. Drill rat hole and mouse hole.
8. Notify all regional, State and Federal authorities with SPUD report.
9. Mix fresh water mud and with 40-50 funnel viscosity and 8.4-9.0 lb/gal weight, or as dictated.
10. Initiate surface drilling with 13 ½" rock bit. Catch samples from 0-600', every 50' and bag.
11. At 800' KB, Trip out of hole while standing back. Run open-hole logs. Pick up and run in hole with 9 5/8" 36# K-55 STC casing. +/- 7 centralizers installed midway on every second joint. Weld bottom joints. Set and Cement according to cement design. Expect +/- 20 bbl MUD FLUSH, 320 SX 50/50 Poz Premium and Lite, 1.47 Yield, designed with 20% Excess.
12. Bump plug and wait on cement.
13. Nipple up 9 5/8" casing spool. Nipple up 3000# hydraulic annular preventer, 5K Blow out preventer, pipe over blinds, and choke manifold. Test.
14. Pick up 8 3/4" Tri-Cone Rock bit, crows foot (pump through check plug), 12 x 6 ¼" drill collars, change over, drill pipe (Portions of bottom hole assembly subject to design change). Trip into plug and trip out while standing back. Run cased hole logs for surface casing.
15. Inspect and test pipe rams. Move in rig up Service Mud.
16. Trip in hole with bottom hole assembly and drill through surface shoe and test.
17. At the appropriate depth as determined by mud logging, Move in rig up testers. Trip out of hole while standing back.
18. Pick up drill stem testing tool and run in hole. Drill stem test the proposed injection horizons, 60 minute flow-120 minute shut-60 minute flow-90 minute shut. Catch fluid samples and analyze. Rig down move out testers.
19. Proceed to drill to 5,550' Total Vertical Depth, Total Depth will be +/- 5,500', which is across all injection horizons.
20. At Total Depth, pull off bottom 1 stand and circulate. Make long short trip.
21. Condition well for Open Hole Logs.
22. Trip out of hole while laying down drill pipe and Bottom hole assembly.
23. Mover in rig up wireline service. Run open hole suite. Rig down move out wireline service.
24. Move in rig up casing crew. Pick up and Run in hole with 7" guide shoe, short joint, 7" float collar, 7" x 5.5" liner hanger, 7" 29#-23# N-80 or equivalent API grade LTC production casing to surface. Run centralizers every other joint from Total Depth to +/- 3000' True Vertical Depth. Weld bottom 5 Joints. Run DV Tool at +/- 3500,' so as to bring cement to surface.
25. Move in rig up cement services.
26. Haul in biocide treated fresh water for cement displacement.
27. Cement the production casing as per the design proposal while reciprocating.
    Stage 1: 20 SX Mud flush, 240 SX 50/50 Poz Premium-Class A Premium, 1.24 Yield, designed with 20% Excess. Work Casing and Open DV tool, Stage 2: 430 SX 14.2 LITE Premium, 1.47

Yield, designed with 20% Excess Stage 2 Top of cement: Surface.

32. Drop the plug and displace cement.
31. Rig down move out casing crew. Rig down move out cement services.
32. Set casing cap.
33. Rig down move out Drilling Unit.

Completion

34. Set rig anchors. Move in rig up service unit. Spot power swivel and rig tank. Nipple up blow out preventer, pipe over blinds.
35. Pick up 6 3/4" blade bit, cross over and 2 7/8" 6.4# tubing. Pick up power swivel. Drill out the DV tool and run to Total depth.
36. At Total depth, spot and wash and displace 1,000 gallons of dilute HCl as per stimulation procedure. Trip out of hole while standing back. Lay down drill bit.
37. Mover in rig up wireline. If necessary, Pick up and Run in hole with wireline set, tubing retrievable bridge plug. Set above liner hanger. Fill hole with fluid.
38. Run Cement bond long, variable density log, casing collar locator log.
37. Pick up straddle packer and Run in hole to Open Hole. Pump additional HCl as per stimulation procedure.
38. Run formation parting test and injection test as follows:

    a. Install a calibrated 3,000 psi pressure gauge and recorder on the discharge line of the pump.

    b. Pump water into well at a slow rate and obtain a stabilized injection pressure. Record rates, pressures, and time duration of entire test,

    c. Increase injection rate slightly and keep pumping until a stabilized pressure is obtained. Continue this incremental pumping until formation parting is recognized. At that time, the rate of injection will increase rapidly with a slight increase in pressure.

    d. Plot data and determine formation parting pressure.

    e. After establishing the parting of formation, run three or more injection tests at different stabilized rates and pressures below the parting pressure.

39. Conduct pressure fall-off test. After injection test is completed, shut well in and record the pressure until a stabilized pressure is obtained, or pressure drops below zero gauge pressure. If it is below zero gauge pressure, measure the fluid level. If test results prove unsatisfactory, additional stimulation may be done to improve the effective permeability at the well bore. This may include additional acid treatment.
40. Pick up and repeat 36-39 over the Sylvania Sandstone.
41. Trip out of hole while standing back. Pick up slotted liner and run in hole and land.
42. Trip out of hole while laying down 2 7/8" tubing.
43. Pick up 4.5" 10' tailpipe, Seating nipple, change over, 7" 10K Arrowset full bore packer, 10' pup joint, Seating nipple, 4.5" 11.6# tubing and Run in hole to +/- 5090' KB.
44. Displace casing fluid with annulus fluid.
45. Set packer in compression.

46. Test casing and packer seal.
47. Nipple down blow out preventer. Nipple up 7" 5K x 4.5" wellhead.
47. Rig down move out service unit.

The pressure testing of the 7" casing to 80% of burst pressure will take place prior to the initial mining. This pressure exceeds 133% of operating pressure. A packer will run to the bottom and the pressure checked in the final stages before injection commences.

Please refer to Figure F14 for a well schematic of the proposed injection well.

L.2 Timetable for drilling, logging and formation testing

Anticipated timing for drilling is permit dependent.

Drill time, following spud, will approximate 12 days for drilling and casing, 3 days for formation testing for fluid recovery, and 1 day for open hole logging. This is a total anticipated time of sixteen days per well.

L.3 Open hole and cased hole logs

As per Section L.1, re-stated here.

Open Hole

Surface Cashing: Resistivity, Spontaneous Potential, Caliper and GR.

Production Casing: Resistivity, Spontaneous Potential, Neutron Density, Compensated Formation Density, Gamma Ray, Caliper, Photo-Electric Effect, Multi-pad Micro Resistivity (i.e. Dip-meter-Fracture Finder), Borehole volume analysis

Cased Hole

Surface Cashing: cement bond log, variable density log with collar locator, and temperature log

Production Casing: A state of the art, cement bond log variable density log, and collar locator will be run from total depth to surface. The depth of the casing is checked using a collar locator log to locate the marker joint. Before any injection commences, a baseline temperature log will also be run, so that comparative analysis can be performed following the commencement of injection.

L.4 Mechanical integrity testing (cement bond logs, radioactive tracer log, and temperature, noise or oxygen activation log are required)

All required logs will be run at before any perforations are added to the casing and before fluid injection commences.

The mechanical integrity of all the proposed injection wells will be tested according to the requirements of 40 CPR 146.8 to demonstrate that (1) there are no significant leaks in the casing, tubing, or packer and (2) there is no significant fluid movement into a USDW through vertical channels adjacent to the

injection wellbores. As required by permit, mechanical integrity tests shall be conducted at the required frequency, and especially before any injection commences. The timing of these test shall be dictated according to pro-active best practice.

Required tests include:

1) an approved pressure test in accordance with 40 CFR 146.8(b)(1) [annually];

2) an approved radioactive tracer survey [every five years]; and

3) an approved temperature, noise, oxygen activation or other approved log [every five years];

or 1,2, & 3 above as otherwise directed by permit.

Gauges used in performance of the MIT will be calibrated to an accuracy of not less than 0.5 percent of fullscale prior to field use. A copy of the calibration certificate will be submitted to USEPA each time the gauge is calibrated.

Notice will be made to the USEPA and the MDEQ at least thirty days prior to the date of the schedule MIT. Tests must be witnessed by a representative of the USEPA and/or MDEQ. A written report of the results of the MIT will be made to the USEPA within 45 days following completion of the MIT.

L.5 Buffer fluid and volume, if any

Initially, the annular space between the injection tubing and casing in the injection wells will be displaced with a quantity of inhibited brine.

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CLASS I

ATTACHMENT M: CONSTRUCTION DETAILS

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTCHEMENT M.
CONSTRUCTION DETAILS

EPA instruction, form 7520-6 (2011):
CONSTRUCTION DETAILS - Submit schematic or other appropriate drawings of the surface and subsurface construction details of the well.

The following information should be included in well schematics and/or tables, Cement volumes will be slightly greater for the MPC 2D, whereby, the calculated cement volumes for the MPC 2D can be referenced on the proposed wellbore diagram, Figure 14:

M.1 Construction of well, including total depth, completion type, casing sizes, types, weights, and setting depths

Casing and Cement Design

Casing	Hole Size	Casing OD	Weight	Grade	Thread	Set at
Conductor	20”	16”	65#	H-40	STC	100’
Surface	13 ½”	9 5/8”	36”	J-55	STC	800’

Cemented With = 320 SX 50/50 Poz and Lite, 1.47 Yield, designed with 20% Excess
To Estimated TOC = Surface

Casing	Hole Size	Casing OD	Weight	Grade	Thread	Set at
Production	8 3/4”	7”	23#, 26#, 29#	J-55,L-80	LTC	5,160’
DV Tool		7”				3,500
Slotted Liner	8 3/4”	5.5”				5,550’

Cemented With = Stage 1: 240 SX 50/50 Poz-Class A, 1.24 Yield, designed with 20% Excess
Stage 1 TOC: 3,500’
Stage 2: 430 SX 14.2 LITE, 1.47 Yield, designed with 20% Excess
Stage 2 TOC: Surface

M.2 Cement type and amount for all casing

Please refer to Section M.1 and to Figure L.1-1.

M.3 Tubing and packer specifications, including size, type, and setting depths

Woodward 1-26

Tubing Size	4-1/2 inch
Tubing Type	J-55, LT&C
Coating	TK69 epoxy
Tubing Weight	11.6#/ft
Packer	Arrowset 10K set at 5090’, tail pipe to 5,100’

M.4 Wellhead construction details

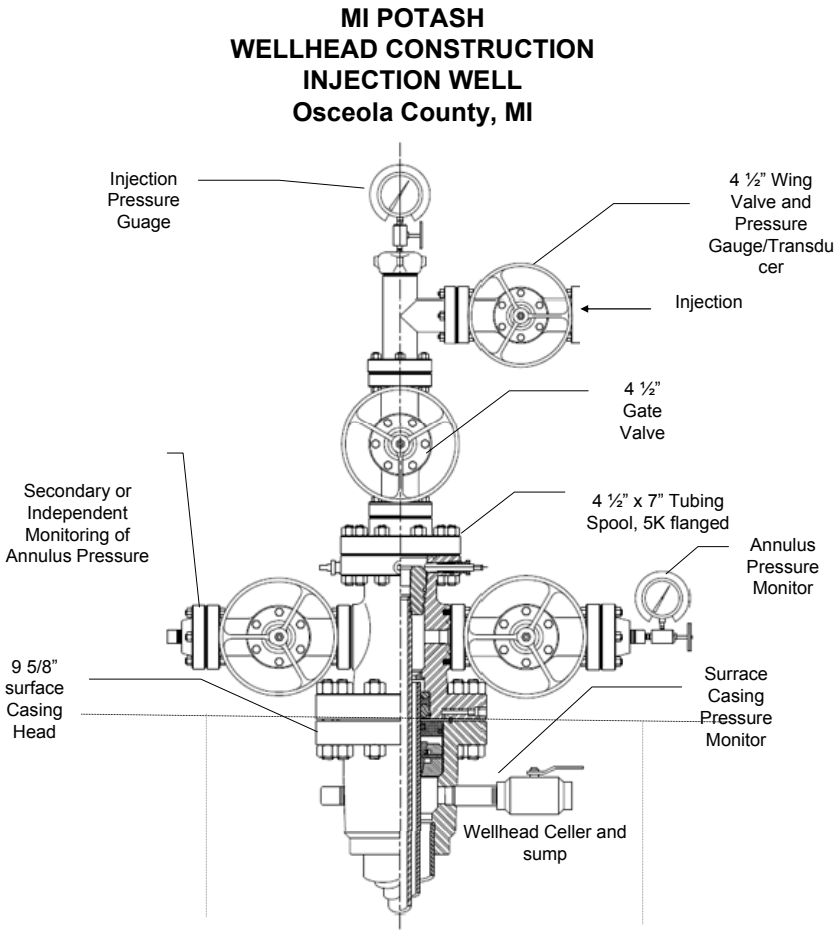

FIGURE M1.

Well Area

The well head will be surrounded by a concrete and steel sump. This sump will drain by gravity through a pipeline into a sump within the test mining facility processing building, where any leakage will be captured by a sump pump and re-injected into the circulating fluid system.

M.5 Location of sample tap and female coupling for independent determination of annulus pressure

Please refer top Figure M1.

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT N: CHANGES IN INJECTION FLUID

NOT APPLICABLE TO CLASS I WELLS

THE UNITED STATES POTASH PROJECT
JANUARY 2015

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT O: PLANS FOR WELL FAILURES

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHEMENT O.
CONTINGENCY PLAN FOR WELL FAILURES.

EPA instruction, form 7520-6 (2011):
Outline contingency plans (proposed plans, if any, for Class II) to cope with all shut-ins or wells failures, so as to prevent migration of fluids into any USDW. The applicant should submit contingency plans for 1) actions that will be taken if mechanical integrity of well is lost; and 2) storage or alternate treatment or disposal of waste in the case of emergency shut-in.

O.1 Contingency Plan

Item 1: Actions to be taken in the event of loss of mechanical integrity:

Brine is transmitted through the wells in tubing suspended from the wellhead and extending to a point near the top of the receiving formation. At or near the bottom of the tubing, the annulus between the tubing and the cemented casing is sealed with a packer; thus, the entire annulus from the wellhead to the packer is sealed off from the injected brine. The annulus is filled with an inhibited brine to a point slightly below the freeze line where the remainder of space is filled with oil. The annulus pressure is maintained to hold 20 psi at all times at surface and is monitored with a continuously recording pressure gauge.

If mechanical integrity was compromised the annulus fluid pressure would change and any change would be immediately detected by a change in the annulus pressure. If the injection tubing or packer developed a leak, a change in the annulus pressure would develop and would also be immediately detected by the continuously recording pressure gauge. In either case, investigative and remedial action would be promptly taken to replace or repair the part damaged following the procedures listed in Section C-1.

Item 2: Plan for alternate disposal in the case of emergency shut-in:

The multiple well application allows for an excess of disposal capacity and optionally to allow for system upsets, emergency shut-in, and contingent disposal capacity.

If failure were to occur to one well, that well would be shut-in immediately, and the entire disposal flow would be directed to the other well(s). If necessary , flow rates would be reduced as needed to remain below permitted injection pressure limits.

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NON HAZARDOUS

CLASS I

ATTACHMENT P: MONITORING PROGRAM

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHEMENT P.
MONITORING PROGRAM

EPA instruction, form 7520-6 (2011):
Discuss the planned monitoring program. This should be thorough, including maps showing the number and location of monitoring wells as appropriate and discussion of monitoring devices, sampling frequency, and parameters measured. If a manifold monitoring program is utilized, pursuant to §146.23(b)(5), describe the program and compare it to individual well monitoring.

P.1 Waste Analysis Plan

The Waste Analysis Plan is included as an addendum.

P.2 Description of monitoring and recording system for injection pressure, rate, volume, and for annulus pressure

- Injection flow rate, injection pressure, cumulative brine volume, and tubing-casing annulus pressure are monitored with continuous recording devices. The below described equipment is a select group of chosen equipment for electrical continuous use. In addition, pneumatic and traditional gauges and back-up electronic gauges will be installed at the pump house. Each will be recorded via a pls recording system and human interface system.

  Injection pressure gauge(s)
  Surface Injection Pressure Gauge: ABB Model 266HSH, V 0 -8700 PSI
  Location: Installed directly into the wellhead tree cap port.
  Type: Electrical; Continuous Recording
  Operating Range (psig): 0 – 8700; this exceeds maximum operating range of system by more than 1000%

  Casing-tubing annular pressure gauge(s)
  Annular Pressure Gauge: ABB Model 266HSH, Q 0 -2400 PSI
  Location: Mounted on the wellhead port open to the casing-tubing annulus.
  Type: Electrical (4-20 mA); Continuous Recording
  Operating Range (psig): 0 – 2400; this exceeds maximum operating range

  Flow meter(s) and Temperature
  Injection Flow Meter, ABB FS4000 integrated with ABB PT100
  Type: Electrical; Continuous Recording

- Well operations personnel visually inspect the continuous monitoring and pneumatic recording devices and instrumentation at least once per day.

- Monitoring devices are calibrated by qualified personnel at least every 6 months. Recording devices are serviced by qualified personnel at the same time or more frequently as required.

- Injection fluid characteristics are monitored according to the Waste Analysis Plan.

- Pressure build-up in the injection zone caused by the operation of the well is monitored daily, monthly, and annually.

P.3 Description of sight glass level monitoring and recording, if a seal pot system of annulus pressure maintenance is utilized

A seal port system is not intended to be used on any of the proposed injection wells.

P.4 Groundwater Monitoring Plan and Quality Assurance Project Plan

This requirement is technically required only for wells injecting restricted hazardous wastes.

Michigan Potash Operating intends only to inject non hazardous salt brine.

As a best practice, Michigan Potash Operating will be installing ground water monitoring wells surrounding the injection well site, down gradient.

In the AOR, groundwater generally moves in the direction of the defining topography. The static water well map, as per Figure D10 and as per Figure K1 will define the placement of groundwater monitoring wells.

Data (chlorides) will be monitored and reported to the USEPA on a quarterly basis. Chloride levels in disposal brine and process streams are typically one thousand times greater than background levels. Sampling for chlorides in the monitor well network will provide clear indication of a process system upset should such occur,

QA/QC is discussed throughout the Waste Analysis Plan (Appendix P-1).

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT Q: PLUGGING AND ABANDONEMENT

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHEMENT Q.
PLUGGING AND ABANDONMENT PLAN

EPA instruction, form 7520-6 (2011):
PLUGGING AND ABANDONMENT PLAN -Submit a plan for plugging and abandonment of the well including: (1) describe the type, number, and placement (including the elevation of the top and bottom) of plugs to be used; (2) describe the type, grade, and quantity of cement to be used; and (3) describe the method to be used to place plugs, including the method used to place the well in a state of static equilibrium prior to placement of the plugs. Also for a Class III well that underlies or is in an exempted aquifer, demonstrate adequate protection of USDWs. Submit this information on EPA Form 7520-14, Plugging and Abandonment Plan.

Q.1 Signed plugging and abandonment form showing amount and type of cement, placement method, and estimated cost (Region V requires a cement plug to extend from the base of the lowermost casing to the surface)

(1) Following is a visual wellbore diagram of the proposed wellbore schematics, matching that of Figure F14 for the three proposed wellbores; and

(2) a visual wellbore diagram of the plugged and abandoned wellbores; and

(3) the analogous USEPA wellbore schematic of before and after; and

(4) the USEPA Plugging and Abandonment estimate worksheets, including the General information form and the detailed cost estimate worksheet; and

(5) Form 7520-14 as signed.

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MPC 1D

SURFACE: NW/4 SEC 31, T17N R08W, 43.825947, -85.323008

VERTICAL WELL

OSCEOLA COUNTY, MI

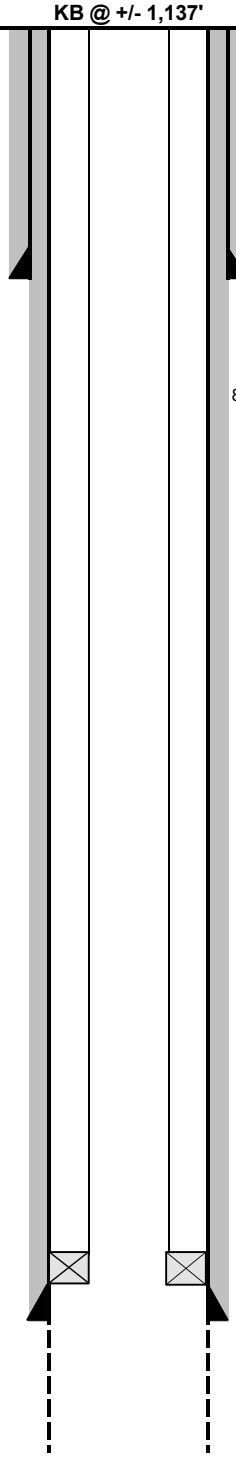
PROPOSED WELLBORE DIAGRAM

GL @ +/-1,124'

KB @ +/- 1,137'

UPDATED JAN 2015 BY TAP

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	0	0
Quaternary F1	59	59
Quaternary F	138	138
Quaternary E	323	323
Quaternary E/1	393	393
Quaternary D	439	439
Jurrasic Red Beds	513	513
Pennsylvantian		
Michigan	1205	1205
Marshall Sandstone	1653	1653
Coldwater Shale	1818	1818
Antrim Shale	2565	2565
Traverse Formation	3228	3228
Bell Shale	3802	3802
Dundee/Reed City	**3858**	**3858**
Detroit River Group	4088	4088
Amherstburg	4962	4962
Sylvania Sand Stone	**5105**	**5105**
Bois Blanc	5300	5300
Bass Islands Group	**5355**	**5355**



17 1/2" HOLE

SURFACE CASING

13-3/8" 54.5# J-55

SET @ 800'

Cement to Surface

320 SX 50/50 Poz and Lite, 1.47 Yield

8 3/4" HOLE DRILLED TO 5,500' (5,500 TVD)

Production String

4.5# 11.6-15.5 L-80

Arrow Set 10K 7" Packer at +/- 5050' MD

Set in Compression

Annulus fluid is inhibited brine, +/- 1.1-1.2 SG

PRODUCTION CASING

7" 23-38# N-80

SET @ 5,160' MVD, TVD

BASE of AMHURSTBURG

DV Tool @ 3,500'

Cement from Shoe to Surface

Stage 1: 240 SX 50/50 Poz-Class A, 1.24 Yield

Stage 2: 430 SX 14.2 LITE, 1.47 Yield

LINER HANGER AT +/ - 5,100'

SLOTTED LINER BELOW CASING SHOE

TO TD AT +/- 5,550

PBTD = TD

TD @ +/- 5,550'

FIGURE F14.

MPC 1D

SURFACE: NW/4 SEC 31, T17N R08W, 43.825947, -85.323008

VERTICAL WELL

OSCEOLA COUNTY, MI

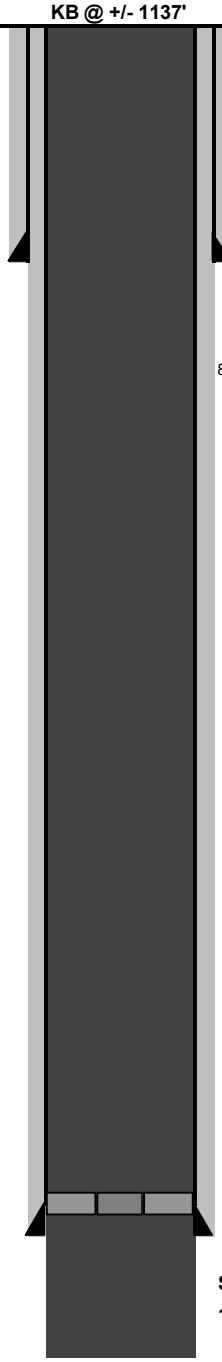
P & A WELLBORE DIAGRAM

GL @ +/-1,124'

KB @ +/- 1137'

UPDATED JULY 11TH 2014 BY TAP

	TVD	MD
Quaternary H	0	0
Quaternary G	0	0
Quaternary F1	59	59
Quaternary F	138	138
Quaternary E	323	323
Quaternary E/1	393	393
Quaternary D	439	439
Jurrasic Red Beds	513	513
Pennsylvantian		
Michigan	1205	1205
Marshall Sandstone	1653	1653
Coldwater Shale	1818	1818
Antrim Shale	2565	2565
Traverse Formation	3228	3228
Bell Shale	3802	3802
Dundee/Reed City	**3858**	**3858**
Detroit River Group	4088	4088
Amherstburg	4962	4962
Sylvania Sand Stone	**5105**	**5105**
Bois Blanc	5300	5300
Bass Islands Group	**5355**	**5355**



17 1/2" HOLE

SURFACE CASING

13-3/8" 54.5# J-55

SET @ 800'

Cement to Surface

320 SX 50/50 Poz and Lite, 1.47 Yield

Lowest USDW at 550', behind surface casing.

8 3/4" HOLE DRILLED TO 5,500' (5,500 TVD)

PRODUCTION CASING

7" 23-38# N-80

SET @ 5,160' MVD, TVD

DV Tool @ 3,500'

Cement from Shoe to Surface

Stage 1: 240 SX 50/50 Poz-Class A, 1.24 Yield

Stage 2: 430 SX 14.2 LITE, 1.47 Yield

Plug Cement from Retainer to Surface

775 SX Class A, Neat from Cmt Retiainer to Surface

1.47 Yield

Cement Retainer @ 5,130'

Squeeze 175 SX Class A, Neat below Cmt Retainer

1.47 Yield at 130%.

PBTD = TD

TD @ +/- 5,550'

Figure 14. P & A

MPC 2D

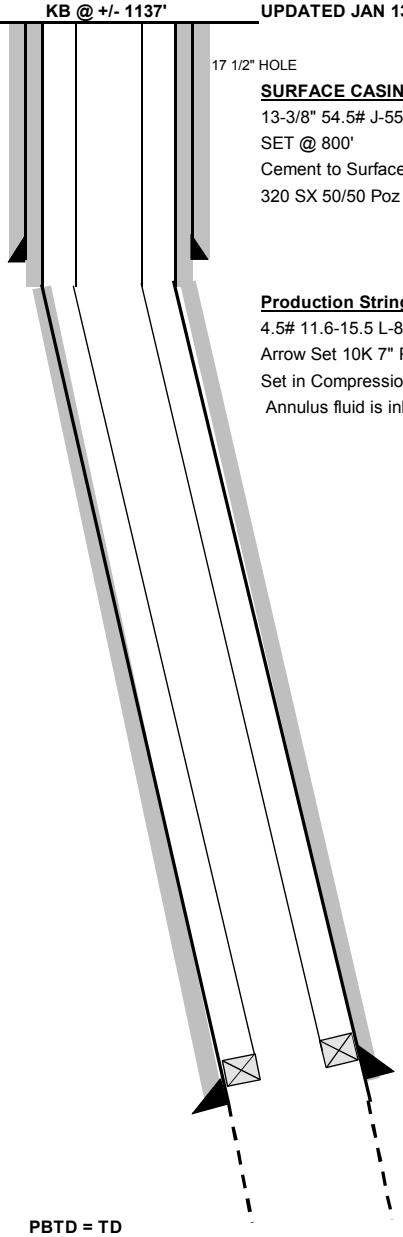
SURFACE: NW/4 SEC 31, T17N R08W, 43.825948, -85.322932
BOTTOM: SW/4 SEC 30, T17N R08W, 43.832871, -85.322873
OSCEOLA COUNTY, MI

PROPOSED WELLBORE DIAGRAM

GL @ +/-1,124'
KB @ +/- 1137'

UPDATED JAN 13, 2015 BY TAP

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	117	117
Quaternary F1	165	165
Quaternary F	196	196
Quaternary E	342	342
Quaternary E/1	410	410
Quaternary D	461	461
Jurrasic Red Beds	537	537
Pennsylvantian	706	706
Michigan	1261	1317
Marshall Sandstone	1719	1836
Coldwater Shale	1893	2034
Antrim Shale	2653	2897
Traverse Formation	3296	3626
Bell Shale	3889	4299
Dundee/Reed City	**3945**	**4363**
Detroit River Group	4170	4618
Amherstburg	4962	5517
Sylvania Sand Stone	**5194**	**5718**
Bois Blanc	5383	5995
Bass Islands Group	**5437**	**6057**



17 1/2" HOLE

SURFACE CASING
13-3/8" 54.5# J-55
SET @ 800'
Cement to Surface
320 SX 50/50 Poz and Lite, 1.47 Yield

Production String
4.5# 11.6-15.5 L-80
Arrow Set 10K 7" Packer at +/- 5600' MD
Set in Compression
Annulus fluid is inhibited brine, +/- 1.1-1.2 SG

PRODUCTION CASING
7" 23-38# N-80
SET @ 5,700' MVD, 5,185' TVD
BASE of AMHURSTBURG
DV Tool @ 3,500' TVD, 3,858', MD
Cement from Shoe to Surface
Stage 1: 270 SX 50/50 Poz-Class A, 1.24 Yield
Stage 2: 473 SX 14.2 LITE, 1.47 Yield

LINER HANGER AT +/ - 5,600' MD
SLOTTED LINER BELOW CASING SHOE
TO TD AT +/- 6,130 MD

PBTD = TD
TD @ +/- 5,550' TVD, 6,130 MD

FIGURE F14.

MPC 2D

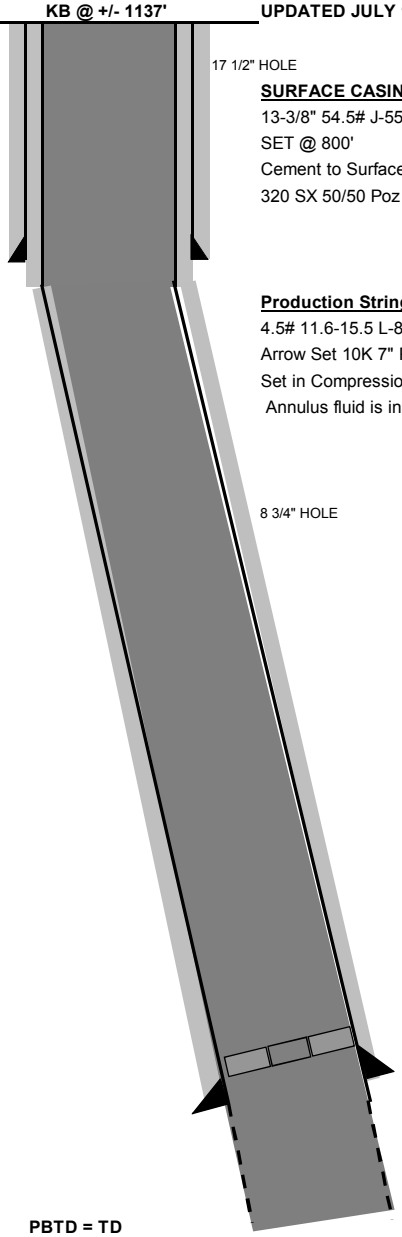
SURFACE: NW/4 SEC 31, T17N R08W, 43.825948, -85.322932
BOTTOM: SW/4 SEC 30, T17N R08W, 43.832871, -85.322873
OSCEOLA COUNTY, MI

PLUGGED WELLBORE DIAGRAM

GL @ +/-1,124'
KB @ +/- 1137'

UPDATED JULY 11Th 2014 BY TAP

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	117	117
Quaternary F1	165	165
Quaternary F	196	196
Quaternary E	342	342
Quaternary E/1	410	410
Quaternary D	461	461
Jurrasic Red Beds	537	537
Pennsylvantian	706	706
Michigan	1261	1317
Marshall Sandstone	1719	1836
Coldwater Shale	1893	2034
Antrim Shale	2653	2897
Traverse Formation	3296	3626
Bell Shale	3889	4299
Dundee/Reed City	**3945**	**4363**
Detroit River Group	4170	4618
Amherstburg	4962	5517
Sylvania Sand Stone	**5194**	**5718**
Bois Blanc	5383	5995
Bass Islands Group	**5437**	**6057**



17 1/2" HOLE

SURFACE CASING
13-3/8" 54.5# J-55
SET @ 800'
Cement to Surface
320 SX 50/50 Poz and Lite, 1.47 Yield

Production String
4.5# 11.6-15.5 L-80
Arrow Set 10K 7" Packer at +/- 5600' MD
Set in Compression
Annulus fluid is inhibited brine, +/- 1.1-1.2 SG

8 3/4" HOLE

PRODUCTION CASING
7" 23-38# N-80
SET @ 5,700' MVD, 5,185' TVD
BASE of AMHURSTBURG
DV Tool @ 3,500' TVD, 3,858', MD
Cement from Shoe to Surface
Stage 1: 270 SX 50/50 Poz-Class A, 1.24 Yield
Stage 2: 473 SX 14.2 LITE, 1.47 Yield

Plug Cement from Retainer to Surface
840 SX Class A, Neat from Cmt Retiainer to Surface
1.47 Yield

Cement Retainer @ 5,590 MD.

Squeeze 200 SX Class A, Neat below Cmt Retainer
1.47 Yield at 130%.

PBTD = TD
TD @ +/- 5,550' TVD, 6,130 MD

FIGURE F14.

MPC 3D

SURFACE: NW/4 SEC 31, T17N R08W, 43.818448, -85.326073

VERTICAL WELL

OSCEOLA COUNTY, MI

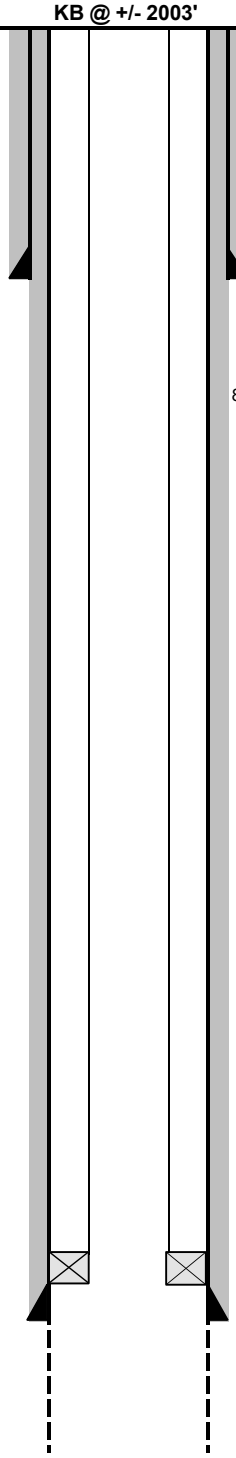
PROPOSED WELLBORE DIAGRAM

GL @ +/-1,190'

KB @ +/- 2003'

UPDATED JULY 11Th 2014 BY TAP

Geological Zone	TVD	MD
Quaternary H	0	0
Quaternary G	117	117
Quaternary F1	165	165
Quaternary F	196	196
Quaternary E	342	342
Quaternary E/1	410	410
Quaternary D	461	461
Jurrasic Red Beds	537	537
Pennsylvantian	706	706
Michigan	1261	1261
Marshall Sandstone	1719	1719
Coldwater Shale	1893	1893
Antrim Shale	2653	2653
Traverse Formation	3296	3296
Bell Shale	3889	3889
Dundee/Reed City	**3945**	**3945**
Detroit River Group	4170	4170
Amherstburg	5019	5019
Sylvania Sand Stone	**5194**	**5194**
Bois Blanc	5383	5383
Bass Islands Group	**5437**	**5437**



17 1/2" HOLE

SURFACE CASING

13-3/8" 54.5# J-55

SET @ 800'

Cement to Surface

320 SX 50/50 Poz and Lite, 1.47 Yield

8 3/4" HOLE DRILLED TO 5,500' (5,500 TVD)

Production String

4.5# 11.6-15.5 L-80

Arrow Set 10K 7" Packer at +/- 5050' MD

Set in Compression

Annulus fluid is inhibited brine, +/- 1.1-1.2 SG

PRODUCTION CASING

7" 23-38# N-80

SET @ 5,160' MVD, TVD

BASE of AMHURSTBURG

DV Tool @ 3,500'

Cement from Shoe to Surface

Stage 1: 240 SX 50/50 Poz-Class A, 1.24 Yield

Stage 2: 430 SX 14.2 LITE, 1.47 Yield

LINER HANGER AT +/ - 5,100'

SLOTTED LINER BELOW CASING SHOE

TO TD AT +/- 5,550

PBTD = TD

TD @ +/- 5,550'

FIGURE F14.

MPC 3D

SURFACE: NW/4 SEC 31, T17N R08W, 43.818448, -85.326073

VERTICAL WELL

OSCEOLA COUNTY, MI

PLUGGED WELLBORE DIAGRAM

GL @ +/-1,190'

KB @ +/- 2003'

UPDATED JULY 11Th 2014 BY TAP

	TVD	MD
Quaternary H	0	0
Quaternary G	117	117
Quaternary F1	165	165
Quaternary F	196	196
Quaternary E	342	342
Quaternary E/1	410	410
Quaternary D	461	461
Jurrasic Red Beds	537	537
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Michigan	1261	1261
Marshall Sandstone	1719	1719
Coldwater Shale	1893	1893
Antrim Shale	2653	2653
Traverse Formation	3296	3296
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Dundee/Reed City	**3945**	**3945**
Detroit River Group	4170	4170
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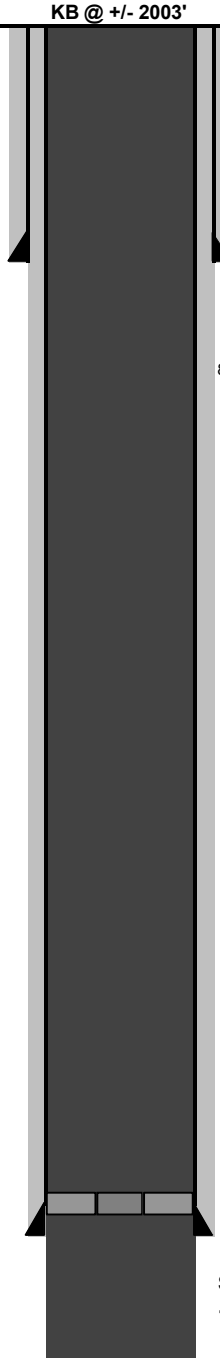


17 1/2" HOLE

SURFACE CASING

13-3/8" 54.5# J-55

SET @ 800'

Cement to Surface

320 SX 50/50 Poz and Lite, 1.47 Yield

Lowest USDW at 550', behind surface casing.

8 3/4" HOLE DRILLED TO 5,500' (5,500 TVD)

PRODUCTION CASING

7" 23-38# N-80

SET @ 5,160' MVD, TVD

DV Tool @ 3,500'

Cement from Shoe to Surface

Stage 1: 240 SX 50/50 Poz-Class A, 1.24 Yield

Stage 2: 430 SX 14.2 LITE, 1.47 Yield

Plug Cement from Retainer to Surface

775 SX Class A, Neat from Cmt Retiainer to Surface

1.47 Yield

Cement Retainer @ 5,130'

Squeeze 175 SX Class A, Neat below Cmt Retainer

1.47 Yield at 130%.

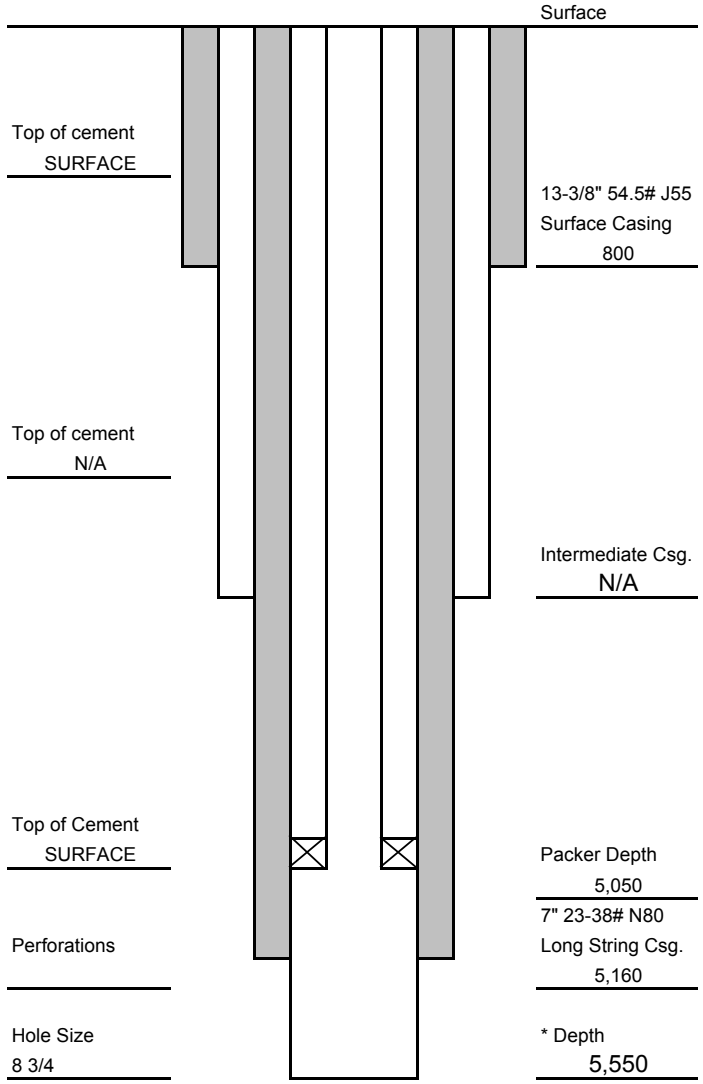
PBTD = TD

TD @ +/- 5,550'

Figure 14. P & A

ORIGINAL WELL CONSTRUCTION DURING OPERATION

MICHIGAN POTASH INJECTION WELL
OSCEOLA COUNTY, MICHIGAN

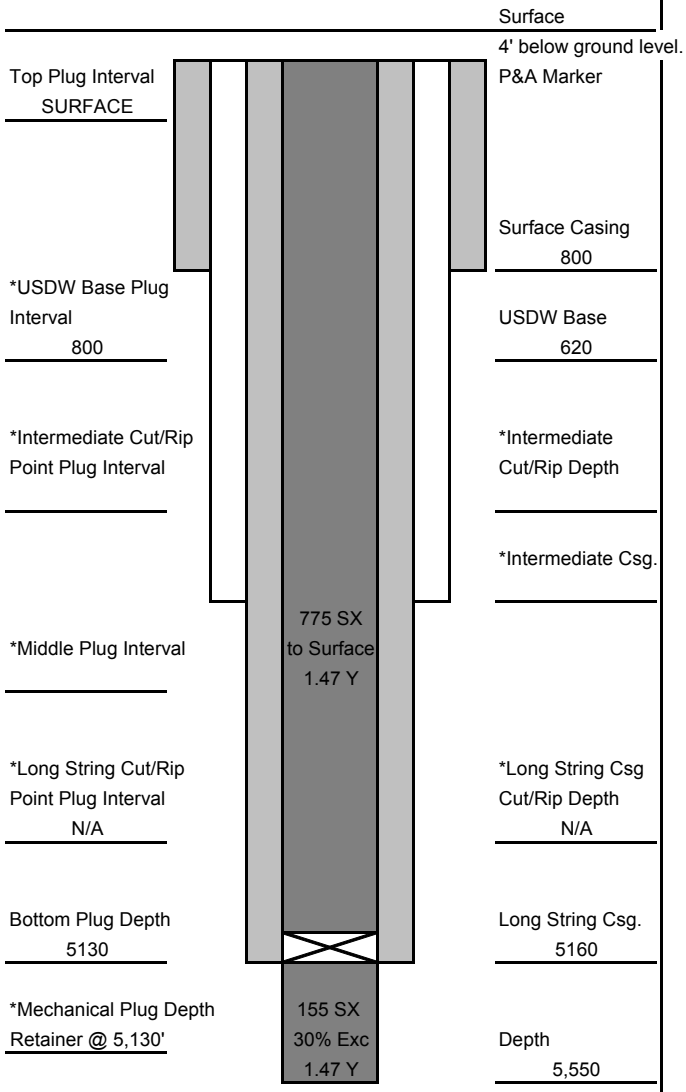


** Add Any Additional Information

* May not Apply

PLUGGING AND ABANDONMENT CONSTRUCTION

MICHIGAN POTASH INJECTION WELL
OSCEOLA COUNTY, MICHIGAN



** Add Any Additional Information

* May not Apply

LIST OF ALL OPEN AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED

Specify Open Hole/ Perforations/ Varied Casing	From	To	Formation Name
OPEN HOLE	5160	5550	Sylvania, Bass Island

Well Location: OSCEOLA COUNTY, MICHIGAN
Well Class: Class I
Type of Well: NONHAZ,
Type "I"
List USDWs:

Formation Name	**Top**	**Bottom**
Quaternary Glacial Till	0	550

Is well construction information current? Y/N

Current Well Construction Information
(Attach a well bore diagram):

Well Construction Information	**Hole Size**	**Casing Size (OD)**	**Casing grade, weight**	**Depth Set**	**Sacks of Cement**
Surface	17.5"	13-3/8	54.5# J-55	800	320
Long String (Production)	8-3/4"	7"	23# L-80	5160	670
Liner					
Tubing					
Other (additional casing string)					

List all perforation(s) past and present:

Perforations	**Depth to Top of Perf**	**Dept to Bottom of Perf**	**Active or Plugged**	**Formation**
OPEN HOLE 1	5160	5550		Sylvania, B. Island
2				
3				
4				
5				
6				

If the perforation has been plugged, list the date and describe the procedure, including cement used, cement tops, etc.:

Total Well Depth: 5,550'

Permittee:	Michigan Potash Operating, LLC
Well Name:	MPC D1, MPC D2, MPC D3
EPA Permit Number:	TBD
Party Providing Cost Estimate:	Magna Energy Services
Total Cost Estimate:	$30,400
Date of Cost Estimate:	8/4/2014

Plug Locations Required for Proper P&A:

Plug Identifier*	**Plug Top**	**Plug Bottom**	**Zone Being Protected** (such as USDW, gas, rip point etc.)
7"casing shoe @ 5160', set Cement Retainer at 5130'. Pump Class A, 13.5 PPG, 1.47 Yield.	5130	5550	Open Hole Injection Zone
Spot Class A, 13.5 PPG, 1.47 Yield, from Retainer to Surface.	Surface	5130	All Intervals, and USDW.

Have any intervals/sections of the wellbore been plugged previously? If so, give the location of the plugs, the circumstances that required the plug and how the plug was set.

Plugging and Abandonment Normal Costs

1. Rig Costs

Travel (Mount Pleasant to Hersey)		miles @		per mile =	
Labor (Super & Crew)		hrs @		per hour =	
Equipment Costs (Rig cost, drilling package, etc.)	250	hrs @	24	per hour =	$6,000
Miscellaneous Site Costs (Tubing work string rental, water storage, flow tanks, mud pit, etc.)		hrs @		per hour =	
Well Head Cutting				=	$ 500.00
Cement Tagging		feet @		per foot =	
Pulling Casing/Tubing		hrs @		per hour =	

2. Cement Costs

Pump Truck & Operator (Including Set Up)	500	hrs @	1	per hour =	$500
Tank Truck & Operator		hrs @		per hour =	
Type Cement Class A Lite	930	sacks @	11.5	per sack =	$10,695
Type Cement		sacks @		per sack =	
Type Cement		sacks @		per sack =	
Cement Retainer(s)	1	retainer(s) @	2500	each =	$2,500
List Retainers Above Open Hole					
Cement Additives (high temperature/pressure)				=	
Balance Plug inc. fluids and testing		plugs @		per plug =	
List Plugs:					
Surface Plug inc. fluids and testing				=	

3. Wireline Service

Transportation		hrs @		per hour =	
Labor		hrs @		per hour =	
Service Charges				=	
Perf/Squeeze		shots @		per shot =	
Cut/pull Casing		rips @		per rip =	
Cement Retainer(s)		retainer(s) @		each =	
List Retainers					
TOC Log				=	
Depth charge for gage rings, junk basket		feet @		per foot =	
Specialized tools for fluid sampling				=	

Permittee:	Michigan Potash Operating, LLC
Well Name:	MPC D1, MPC D2, MPC D3
EPA Permit Number:	TBD
Party Providing Cost Estimate:	Magna Energy Services
Total Cost Estimate:	$30,400
Date of Cost Estimate:	8/4/2014

Plug Locations Required for Proper P&A:

4. Site Preparations & Costs

General Site Engineering & Plan Development				=	
Owner/Operator Site Supervisor				=	
Backhoe & Operator	10	hrs @	50	per hour =	$500
Dozer & Operator		hrs @		per hour =	
Road Construction and Improvement Costs				=	
Pit Liner				=	

5. Transportation & Miscellaneous

Special Land Use Costs (Zoning & Permits)				=	
Winch truck w/driver (wages & mileage)		hrs @		per hour =	
Water truck w/ driver (wages & mileage)		hrs @		per hour =	
Vacuum Truck w/ driver (wages & mileage)		hrs @		per hour =	
2 axle rig-up truck driver& crew wages & mileage)		hrs @		per hour =	
1 axle truck w/ driver (wages & mileage)	1	hrs @	2000	per hour =	$2,000
Hot oiler (equip, labor & mileage)		hrs @		per hour =	
Welder (equip, labor & mileage)		hrs @		per hour =	
Packer Fluid per specs		bbl @		per bbl =	
Hydraulic Jacks		hrs @		per hour =	
Bridge Plug				=	
Waste Disposal Costs				=	
Tool Rental (Describe; examples: Casing Ripper, Collar Buster, etc.)					
Tool 1				=	
Tool 2				=	
Tool 3				=	

6. Remediation Costs (mostly applicable to shallow wells)

Sample Analysis (fluid or soil)	=	
Soil Removal	=	
Site Assessment Study Costs	=	
System Removal Costs (Trucking & Siite Supervision)	=	$2,000
Disposal System Modification Costs (Cement Set Up)	=	$2,500
Installation of Monitoring Well Costs	=	
# Wells:		
Type:		
Depth:		
Construction:		

SUBTOTAL:			=	$27,195
Contingency:	10.0	%	=	$2,720
INITIAL TOTAL			=	$29,915
Inflation factor			=	1.02
TOTAL AMOUNT, Rounded to $100			**=**	**$30,400**

Q.2 Signed estimate of plugging and abandonment costs (and post-closure costs, if applicable) by an independent firm

See the following signed third party estimate, as prepared by Magna Energy Services, which matches the EPA estimate form as per Section Q.1.

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Michigan Potash
Denver, Colorado

P&A Estimate for Michigan Well

Prepared for: Ted Pagano
970-590-3944
Date: September 15, 2014
Version: #1

Submitted by:
Dave Rebol
Magna Energy Services, LLC
17509 Rd 14, Ft. Morgan, Colorado, 80701
1-970-867-9007

Magna appreciates the opportunity to present this proposal and looks forward to being of service to you.

Foreword

Enclosed is our recommended procedure for job description. The information in this proposal includes site data, calculations, materials requirements, and cost estimates. This proposal is based on information from our field personnel and previous services performed in the area.

Magna Energy Services recognizes the importance of meeting society's needs for health, safety, and protection of the environment. It is our intention to proactively work with employees, customers, the public, governments, and others to use natural resources in an environmentally sound manner while protecting health, safety, and environmental processes while supplying high quality products and services to our customers.

We appreciate the opportunity to present this proposal for your consideration and we look forward to being of service to you. Our Services for your well will be coordinated through the Magna location listed below. If you require any additional information or additional services, please feel free to contact me.

Prepared and Submitted by: _____
Dave Rebol

SERVICE LOCATION: Michigan
SERVICE REPRESENTATIVE:
PHONE NUMBER:

MAGNA ENERGY SERVICES

Cost Estimate ***P&A Services***

Mr. Ted Pagano, GM
Michigan Potash Company, LLC

Re: P&A Bid for proposed well

Mr. Pagano,,

Based on the rig rates ($250/hr) and the price for local cement of $11.50/sack. I would estimate the cost to P&A the well in Michigan to as follows:

2 – days @ 12hrs/day @ $250		**$ 6,000**
1 CICR and tool hand to run it		**$ 2,500**
Welder		**$ 500**
Fresh Water (80 bbls)		**$ 500**
Backhoe		**$ 500**
Trucking (pipe)		**$ 2,000**
Cement	**930 sxs @ $11.50**	**$10,695**
Cement Set up		**$ 2,500**
Supervision and permitting		**$ 2,000**
Misc – 10%		**$ 2,720**
	Total	$29,915
EPA Inflation Factor, 1.015%		$30,400

As you know, we operate 10 rigs doing P&As, and I have been in the business for 25 years.

Thank you,

Dave Rebol

Q.3 Closure plan, including plans to acquire a representative fluid sample from the first aquifer overlying the injection zone (only necessary for wells which inject restricted hazardous wastes)

Not Applicable since no restricted hazardous will be injected; only non hazardous salt water (brine) associated with food grade salt and potash processing.

Q.4 Post-closure plan which covers the requirements of 40 CFR 146.72 (only necessary for hazardous waste wells)

Not Applicable since no restricted hazardous will be injected; only non hazardous salt water (brine) associated with food grade salt and potash processing.

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT R: NECESSARY RESOURCES

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHEMENT R.
NECESSARY RESOURCES

EPA instruction, form 7520-6 (2011):

NECESSARY RESOURCES - Submit evidence such as a surety bond or financial statement to verify that the resources necessary to close, plug or abandon the well are available.

Michigan Potash Operating and US Bank have entered into a propositioned relationship to provide the establishment of a Trust, for the purpose of providing financial assurance to verify that the resources necessary to close, plug and abandon the propositioned well(s) is available.

U.S. National Association Bank is able to accept a form of trust agreement that conforms to the EPA trust form; whereby U.S. Bank also serves as Trustee for other EPA UIC assurance throughout the country. US bank has been providing trust services for more than 100 years and currently administers more than 120,000 client matters in its Corporate Trust Division with $4 trillion. U.S. Bank has a credit rating in the top categories from all of Standard & Poor's or Moody's Investor Service and Fitch Ratings. Importantly, U.S. Bank serves as trustee on more than 200 environmental protection or remediation trusts. The bank is involved in environmental trusts involving multiple beneficiaries including EPA and state environmental protection agencies.

The Trust will be funded, as per Section 3.0 of the EPA Trust Agreement prior to the commencement of any operations or the drilling of any of the propositioned wellbores; which is earlier than CFR 40.D Ch 144.63(3)(a)(i), which requires Trust fuding prior to the injection of fluids. Further, the fund will be funded in whole prior to drilling operations commence; whereby CFR 40.D Ch 144.63(3)(a)(i), allows funding in part over the life of the well.

Further, as per CFR 40.D Ch 144.65(a), all the proposed wells occur in the State of Michigan, whereby, the State has dual jurisdiction via the Michigan Department of Environmental Quality, "MDEQ," who requires their own plugging and abaondonment assurance before the issuance of a permit; thereby enabling the EPA regional administrator to consider, not only the above described Trust, but also the MDEQ Surety P&A Bond required before drilling commences.

The third party plug and abandonment estimate is for $ 30,400 per injection well, and can be found in section Q.2.

As the required funding and assurance needs increase to adequately provide plug and abandonment assurance for each of the propositioned wellbores, the Trust funds will be increased as per the Trust Agreement.

U.S. Bank Customer Confidential

Schedule of Fees for Services as Grantor Trustee For Michigan Potash Co, LLC

CTS01010A	**Acceptance Fee** The acceptance fee includes the administrative review of documents, initial set-up of the account, and other reasonably required services up to and including the closing. This is a one-time, non-refundable fee, payable at closing.	$ 500.00
CTS04200	**Trustee** Annual fee for the standard trustee services associated with the administration of the account. Administration fees are payable in advance.	$1,250.00
	Direct Out of Pocket Expenses Reimbursement of expenses associated with the performance of our duties, including but not limited to publications, legal counsel after the initial close, travel expenses and filing fees.	At Cost
	Extraordinary Services Extraordinary Services are duties or responsibilities of an unusual nature, including termination, but not provided for in the governing documents or otherwise set forth in this schedule. A reasonable charge will be assessed based on the nature of the services and the responsibility involved. At our option, these charges will be billed at a flat fee or at our hourly rate then in effect.	

Account approval is subject to review and qualification. Fees are subject to change at our discretion and upon written notice. Fees paid in advance will not be prorated. The fees set forth above and any subsequent modifications thereof are part of your agreement. Finalization of the transaction constitutes agreement to the above fee schedule, including agreement to any subsequent changes upon proper written notice. In the event your transaction is not finalized, any related out-of-pocket expenses will be billed to you directly. Absent your written instructions to sweep or otherwise invest, all sums in your account will remain uninvested and no accrued interest or other compensation will be credited to the account. Payment of fees constitutes acceptance of the terms and conditions set forth.

IMPORTANT INFORMATION ABOUT PROCEDURES FOR OPENING A NEW ACCOUNT:
To help the government fight the funding of terrorism and money laundering activities, Federal law requires all financial institutions to obtain, verify and record information that identifies each person who opens an account.
For a non-individual person such as a business entity, a charity, a Trust or other legal entity we will ask for documentation to verify its formation and existence as a legal entity. We may also ask to see financial statements, licenses, identification and authorization documents from individuals claiming authority to represent the entity or other relevant documentation.

Dated: October 2, 2014

TRUST AGREEMENT

U.S. ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PROGRAM
FINANCIAL RESPONSIBILITY REQUIREMENT

To: U.S. Environmental Protection Agency, Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

TRUST AGREEMENT, the "Agreement", entered into as of _____
(date)
by and between Michigan Potash Operating,
(name of owner or operator)
a Colorado Limited Liability Company, the "Grantor",
(name of state) (corporation, partnership, association, or proprietorship)

and U.S. National Association Bank, ( ) incorporated in the
(name of corporate trustee)

State of _____ Or (X) a national bank, the "Trustee".

WHEREAS, the United States Environmental Protection Agency, "EPA," an agency of the United States Government, has established certain regulations applicable to the Grantor, requiring that an owner or operator of an injection well shall provide assurance that funds will be available when needed for plugging and abandonment of the injection well(s),

WHEREAS, the Grantor has elected to establish a trust to provide all or part of such financial assurance for the facility or facilities identified herein, and

WHEREAS, the Grantor, acting through its duly authorized officers has selected the Trustee to be the trustee under this Agreement, and the Trustee is willing to act as trustee,

NOW THEREFORE, the Grantor and Trustee agree as follows:

Section 1. Definitions. As used in this agreement:

(a) The term "Grantor" means the owner or operator who enters into this Agreement and any successors or assigns of the Grantor.

(b) The term "Trustee" means the Trustee who enters into this Agreement and any successor Trustee.

(c) Facility or activity means any "underground injection well" or any other facility or activity that is subject to regulation under the Underground Injection Control Program.

Section 2. Identification or Facilities and Cost Estimates. This Agreement pertains to the facilities and cost estimates identified on attached Schedule A (attached). (Schedule A lists, for each facility, the EPA identification number, name, address, and the current plugging and abandonment cost estimate, or portions thereof, for which financial assurance is demonstrated.)

Section 3. Establishment of Fund. The Grantor and the Trustee hereby establish a trust fund, the "Fund," for the purpose of assuring compliance with the plugging and abandonment requirements established by EPA for the facilities identified on Schedule A. The Underground Injection Control regulations which govern the authorization to inject include a requirement for such financial assurance that the well or wells shall be plugged and abandoned at the time designated by EPA. The Grantor and Trustee acknowledge that the Fund and all expenditures from the Fund shall be to fulfill the legal obligations of the Grantor under such regulations, and not any obligation of EPA. The Grantor and the Trustee intend that no third party have access to the Fund except as herein provided. The Fund is established initially as consisting of the property, which is acceptable to the Trustee, described in Schedule B attached hereto. Such property and any other property subsequently transferred to the Trustee is referred to as the Fund, together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible, nor shall it undertake any responsibility, for the amount or adequacy of any additional payments necessary to discharge any liabilities of the Grantor established by EPA, nor shall the Trustee have any duty to collect such additional amounts from the Grantor.

Section 4. Payment for Plugging and Abandonment. The Trustee shall make payments from the Fund only for the costs of plugging and abandonment ("P&A") of the injection wells covered by this Agreement and the associated P&A Plan, only after EPA has advised the Trustee that work has been completed under the P&A Plan that complies with 40 C.F.R. § 144.28 and/or § 144.52. The Trustee shall not refund to the Grantor any amounts from the Fund unless and until EPA has advised the Trustee that the P&A Plan has been successfully completed. The Trustee shall not release any funds to the Grantor that are necessary to cover liability for any injection wells covered by this Agreement that remain unplugged.

Section 5. Payments Comprising the Fund. Payments made to the Trustee for the Fund shall consist of cash or securities acceptable to the Trustee.

Section 6. Trustee Management. The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this Section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge his duties with respect to the trust fund solely in the interest of the beneficiary and with the care, skill, prudence, and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; *except that:*

(i) Securities or other obligations of the Grantor, or any other owner or operator of the facilities, or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2.(a), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government;

(ii) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal or State government; and

(iii) The Trustee is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time and without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The Trustee is expressly authorized in its discretion: (a) To transfer from time to time any or all of the assets of the Fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and (b) To purchase shares in any investment company registered under the Investment Company Act of 1940, 15 U.S.C. 80a-1 *et seq*., including one which may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the Trustee. The Trustee may vote shares in its discretion.

Section 8. Express Powers of Trustee. Without in any way limiting the powers and discretions conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered: (a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale. No person dealing with the Trustee shall be bound to see to the application of the purchase money or to inquire into the validity or expediency of any such sale or other disposition; (b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted; (c) To register any securities held in the Fund in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depositary with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the United States Government, or any agency or instrumentality thereof, with a Federal Reserve Bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund; (d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal or State government; and (e) To compromise or otherwise adjust all claims in favor of or against the Fund.

Section 9. Taxes and Expenses. All taxes of any kind that may be assessed or levied against or in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expenses incurred by the Trustee in connection with the administration of this Trust, including fees for legal services rendered to the Trustee, the compensation of the Trustee to the extent not paid directly by the Grantor, and all other proper charges and disbursements of the Trustee shall be paid from the Fund.

Section 10. Annual Valuation. The Trustee shall annually, at least 30 days prior to the anniversary date of establishment of the Fund, furnish to the Grantor and to the appropriate EPA Regional Administrator a statement confirming the value of the Trust. Any securities in the Fund shall be valued at market value as of no more than 60 days prior to the anniversary date of establishment of the Fund. The failure of the Grantor to object in writing to the Trustee within 90 days after the statement has been furnished to the Grantor and the EPA Regional Administrator shall constitute a conclusively binding assent by the Grantor, barring the Grantor from asserting any claim or liability against the Trustee with respect to matters disclosed in the statement.

Section 11 Advice of Counsel. The Trustee may from time to time consult with counsel, who may be counsel to the Grantor, with respect to any question arising as to the construction of this Agreement of any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting upon the advice of counsel.

Section 12. Trustee Compensation. The Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing from time to time with the Grantor.

Section 13. Successor Trustee. The Trustee may resign or the Grantor may replace the Trustee, but such resignation or replacement shall not be effective until the Grantor has appointed a successor trustee and this successor accepts the appointment. The successor trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. Upon the successor trustee's acceptance of the appointment, the Trustee shall assign, transfer, and pay over to the successor trustee the funds and properties then constituting the Fund. If for any reason the Grantor cannot or does not act in the event of the resignation of the Trustee, the Trustee may apply to a court of competent jurisdiction for the appointment of a successor trustee or for instructions. The successor trustee shall specify the date on which it assumes administration of the trust in a writing sent to the Grantor, the EPA Regional Administrator, and the present Trustee by certified mail 10 days before such changes become effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this Section shall be paid as provided in Section 9.

Section 14. Instructions to the Trustee. All orders, requests, and instructions by the Grantor to the Trustee shall be in writing, signed by such persons as are designated in the attached Exhibit A or such other designees as the Grantor may designate by amendment to Exhibit A. The Trustee shall be fully protected in acting without inquiry in accordance with the Grantor's orders, requests, and instructions. All orders, requests, and instructions by the EPA Regional Administrator to the Trustee shall be in writing, signed by the EPA Regional Administrators of the Regions in which the facilities are located, or their designees, and the Trustee shall act and shall be fully protected in acting in accordance with such orders, requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the Grantor or EPA hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the Grantor and/or EPA, except as provided for herein.

Section 15. Notice of Nonpayment. The Trustee shall notify the Grantor and the appropriate EPA Regional Administrator, by certified mail within 10 days following the expiration of the 30-day period after the anniversary of the establishment of the Trust, if no payment is received from the Grantor during that period. After the pay-in period is completed, the Trustee shall not be required to send a notice of nonpayment.

Section 16. Amendment of Agreement. This Agreement may be amended by an instrument in writing executed by the Grantor, the Trustee, and the appropriate EPA Regional Administrator, or by the Trustee and the appropriate EPA Regional Administrator if the Grantor ceases to exist.

Section 17. Irrevocability and Termination. Subject to the right of the parties to amend this Agreement as provided in Section 16, this Trust shall be irrevocable and shall continue until terminated at the written agreement of the Grantor, the Trustee, and the EPA Regional Administrator, or by the Trustee and the EPA Regional Administrator if the Grantor ceases to exist. Upon termination of the Trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor.

Section 18. Immunity and Indemnification. The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this

Trust, or in carrying out any directions by the Grantor or the EPA Regional Administrator issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor or from the Trust Fund, or both, from and against any personal liability to which the Trustee may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its defense in the event the Grantor fails to prove such defense.

Section 19. Choice of Law. This agreement shall be administered, construed, and enforced according to the laws of the State of Colorado.

Section 20. Interpretation. As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each Section of the Agreement shall not affect the interpretation or the legal efficacy of this Agreement.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed by their respective representatives duly authorized and their seals to be hereunto affixed and attested as of the date first above written.

GRANTOR

_____

By: __Theodore A. Pagano_____

[Print name]

Its: __General Manager_____

[Title]

Attest:

_____

Its: _____

[Title]

[SEAL]

Before me came the individual whose identity I confirmed as _____, and whose true signature is set forth above; wherefor have I set my hand and and seal this ____day of _____, 200__.

_____

Notary Public

TRUSTEE

_____

By:_____

[Print name]

Its:_____

[Title]

Attest:

_____

Its:_____

[Title]

[SEAL]

Before me came the individual whose identity I confirmed as _____, and whose true signature is set forth above; wherefor have I set my hand and and seal this ____day of _____, 200__.

_____

Notary Public

SCHEDULE A

Identification of Facilities and Cost Estimates

(Schedule A lists, for each facility, the EPA identification number, name, address, and the current plugging and abandonment cost estimate, or portions thereof, for which financial assurance is demonstrated.)

Schedule A is referenced in the Trust Agreement dated _____ by and

between _____Michigan Potash Operating, LLC_____, the "Grantor" and
(name of owner or operator)

_____U.S. National Association Bank_____ (name of the trustee)

EPA Identification Number	Name of Well	Address (Lat-Long)	Third Party Estimate to Plug and Abandon (Date of Estimate)	Financial Assurance to be Demonstrated as Per CFR 40.D Ch 144.63(3)(a)(i)	When as Per CFR 40.D Ch 144.63(3)(a)(i)
TBD	MPC D-1		$ 30,400	$ 30,400	At Drilling and Before Injection
TBD	MPC D-2		$ 30,400	$ 30,400	At Drilling and Before Injection
TBD	MPC D-3		$ 30,400	$ 30,400	At Drilling and Before Injection

SCHEDULE B

Description of Property / Financial Instrument

[Surety, Letter of Credit, etc.]

Schedule B is referenced in the Standby Trust Agreement (Section 3) dated _____

by and between _____Michigan Potash Operating, LLC_____ , the "Grantor,"
(name of owner or operator)

and _____U.S. National Association Bank_____ ___ , the "Trustee."
(name of the trustee)

Description of Property / Financial Instrument:

1. ___Cash, at time of drilling

_____

_____

_____

2. _____

_____

_____

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT S: AQUIFER EXCEPTIONS

THE UNITED STATES POTASH PROJECT
JANUARY 2015

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT T: EXISTING EPA PERMITS

ATTACHEMENT T.
EXISTING EPA PERMITS

EXISTING EPA PERMITS - List program and permit number of any existing EPA permits, for example, NPDES, PSD, RCRA, etc.

T.1 Briefly describe activities which require the applicant to contain permits under the RCRA, UIC, NPDES, or PSD programs. List all permits or construction approvals received or applied for at the facility where the well is located, under any of the following programs:

1) Hazardous Waste Management under RCRA

None.

2) UIC program under SDWA

Michigan Potash Operating is simultaneously applying for an Area non-hazardous Class III injection permit to solution extract food grade salt and potash, whereby, within the AOR, the information and EPA checklist items are duplicitous provided the same AOR.

As referenced in the application, independent from the applicant, but within the AOR are Injection permits MI-133-1I-0001 and MI-133-1I-0002, MIA-133-3G-0002

3) NPDES program under CWA

None.

4) PSD program under CAA

None.

5) Non-attainment program under CAA

None.

6) Dredge and fill permits under Section 404 of CWA

None.

7) Other relevant environmental permits, including State permits

The applicant does not have any other permit applications associated with disposal at the moment.

US EPA UIC PERMIT APPLICATION FORM 7520-6

NON HAZARDOUS

CLASS I

ATTACHMENT U: DESCRIPTION OF BUSINESS

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATTACHEMENT U.
DESCRIPTION OF BUSINESS

DESCRIPTION OF BUSINESS - Give a brief description of the nature of the business.

Michigan Potash Operating's sole business purpose is to intelligibly and carefully handle salt water that is created from the manufacturing of natural agricultural fertilizer that U.S. farmers must have to grow our food.

There are only 12 companies in the world that produce muriate of potash, a natural fertilizer supplement that provides potassium to all living things. Only one remains in the United States, and the U.S. is 86% import reliant, making potash the highest cost fertilizer to our farmers.

NON HAZARDOUS INJECTION

STATE HISTORIC PRESERVATION OFFICE
Application for Review
MPC 1D, MPC 2D, MPC 3D

THE UNITED STATES POTASH PROJECT
JANUARY 2015

ATWELL

December 23, 2014

Mr. Brian Conway
State Historic Preservation Office
Environmental Review Office
Michigan Historical Center
702 W. Kalamazoo Street, P.O. Box 30740
Lansing, MI 48909-8240

RE: Section 106 Review Request
New Underground Injection Well Location
Well Name: MPC-1D
T17N, R08W, Sec. 31, NW¼, NW¼, 1051' FNL, 376' FWL
Evart Township, Osceola County

Dear Mr. Conway,

Michigan Potash Company is proposing to drill a new underground injection well as referenced above. In order to apply for a United States Environmental Protection Agency (USEPA) permit for an underground injection well, the USEPA regulations require a determination that the injection well will not impact any properties listed or eligible for listing in the National Register of Historic Places. Enclosed, please find a completed Section 106 review application pertaining to the proposed well along with the required attachments. Please feel free to contact our office if you should have any questions.

We request that you make your reply directly to:

USEPA
Region 5
77 W. Jackson Bld.
Chicago, IL 60604

With a copy to: Atwell
Attn. J. Dean Geers
7192 E. 34 Road, Suite 4
Cadillac, MI 49601

We wish to thank you in advance for your timely review of this matter.

Respectfully,
ATWELL

J. Dean Geers, P.S. Project Manager

Enclosures

cc: Atwell File 14001984.01

STATE HISTORIC PRESERVATION OFFICE
Application for Section 106 Review

SHPO Use Only				
☐ IN	Received Date ___ / ___ / ___		Log In Date ___ / ___ / ___	
☐ OUT	Response Date ___ / ___ / ___		Log Out Date ___ / ___ / ___	
	Sent Date ___ / ___ / ___			

Submit one copy for each project for which review is requested. This application is required. Please type. Applications must be complete for review to begin. Incomplete applications will be sent back to the applicant without comment. Send only the information and attachments requested on this application. Materials submitted for review cannot be returned. Due to limited resources we are unable to accept this application electronically.

I. GENERAL INFORMATION

☒ THIS IS A NEW SUBMITTAL ☐ THIS IS MORE INFORMATION RELATING TO ER#

- ☐ Funding Notice
- ☐ Survey
- ☐ MOA or PA
- ☒ Other: Brine disposal well and drilling pad

a. Project Name: MPC-1D Well Pad
b. Project Address (if available): N/A-Project lies in the NW 1/4, NW 1/4 of Section 31, T17N, R08W
c. Municipal Unit: Evart Twp. County: Osceola Co
d. Federal Agency and Contact (*If you do not know the federal agency involved in your project please contact the party requiring you to apply for Section 106 review, not the SHPO, for this information.*): USEPA Region 5
e. State Agency and Contact (if applicable): MDEQ Cadillac Office
f. Consultant or Applicant Contact Information (if applicable): Michigan Potash Company

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II. GROUND DISTURBING ACTIVITY (INCLUDING EXCAVATION, GRADING, TREE REMOVALS, UTILITY INSTALLATION, ETC.)

DOES THIS PROJECT INVOLVE GROUND-DISTURBING ACTIVITY? ☒ YES ☐ NO (If no, proceed to section III.)

Exact project location must be submitted on a USGS Quad map (portions, photocopies of portions, and electronic USGS maps are acceptable as long as the location is clearly marked).

a. USGS Quad Map Name: Chippewa Lake North, Michigan
b. Township: 17N Range: 08W Section: 31
c. Description of width, length and depth of proposed ground disturbing activity: 410'L x 250'W x 4'D
d. Previous land use and disturbances: Cultivated Field
e. Current land use and conditions: Dormant Field
f. Does the landowner know of any archaeological resources found on the property? NO
   Please describe:

III. PROJECT WORK DESCRIPTION AND AREA OF POTENTIAL EFFECTS (APE)
Note: Every project has an APE.

a. Provide a detailed written description of the project (plans, specifications, Environmental Impact Statements (EIS), Environmental Assessments (EA), etc. **cannot** be substituted for the written description): See attached
b. Provide a localized map indicating the location of the project; road names must be included and legible.
c. On the above-mentioned map, identify the APE.
d. Provide a written description of the APE (physical, visual, auditory, and sociocultural), the steps taken to identify the APE, and the justification for the boundaries chosen. See attached

IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. List and date **all** properties 50 years of age or older located in the APE. If the property is located within a National Register eligible, listed or local district it is only necessary to identify the district: There are no structures over 50 years of age within the 200' APE.
b. Describe the steps taken to identify whether or not any **historic** properties exist in the APE and include the level of effort made to carry out such steps: Site visit, check of historical registry, inquire of landowner, no known event of common knowledge
c. Based on the information contained in "b", please choose one:
   - ☐ Historic Properties Present in the APE
   - ☒ No Historic Properties Present in the APE
d. Describe the condition, previous disturbance to, and history of any historic properties located in the APE: N/A

V. PHOTOGRAPHS

Note: All photographs must be keyed to a localized map, and should be included as an attachment to this application.

a. Provide photographs of the site itself.
b. Provide photographs of all properties 50 years of age or older located in the APE (faxed or photocopied photographs are not acceptable).

VI. DETERMINATION OF EFFECT

☒ No historic properties affected based on [36 CFR § 800.4(d)(1)], please provide the basis for this determination.

There is no hisstoric structures or objects, no information in the historical registry, no historical event known to take place and no other indication that historic properties lie within the physical APE.

☐ No Adverse Effect [36 CFR § 800.5(b)] on historic properties, explain why the criteria of adverse effect, 36 CFR Part 800.5(a)(1), were found not applicable.

☐ Adverse Effect [36 CFR § 800.5(d)(2)] on historic properties, explain why the criteria of adverse effect, [36 CFR Part 800.5(a)(1)], were found applicable.

Please print and mail completed form and required information to:

State Historic Preservation Office, Environmental Review Office, Michigan Historical Center, 702 W. Kalamazoo Street, P.O. Box 30740, Lansing, MI 48909-8240

ATWELL

Project Work Description

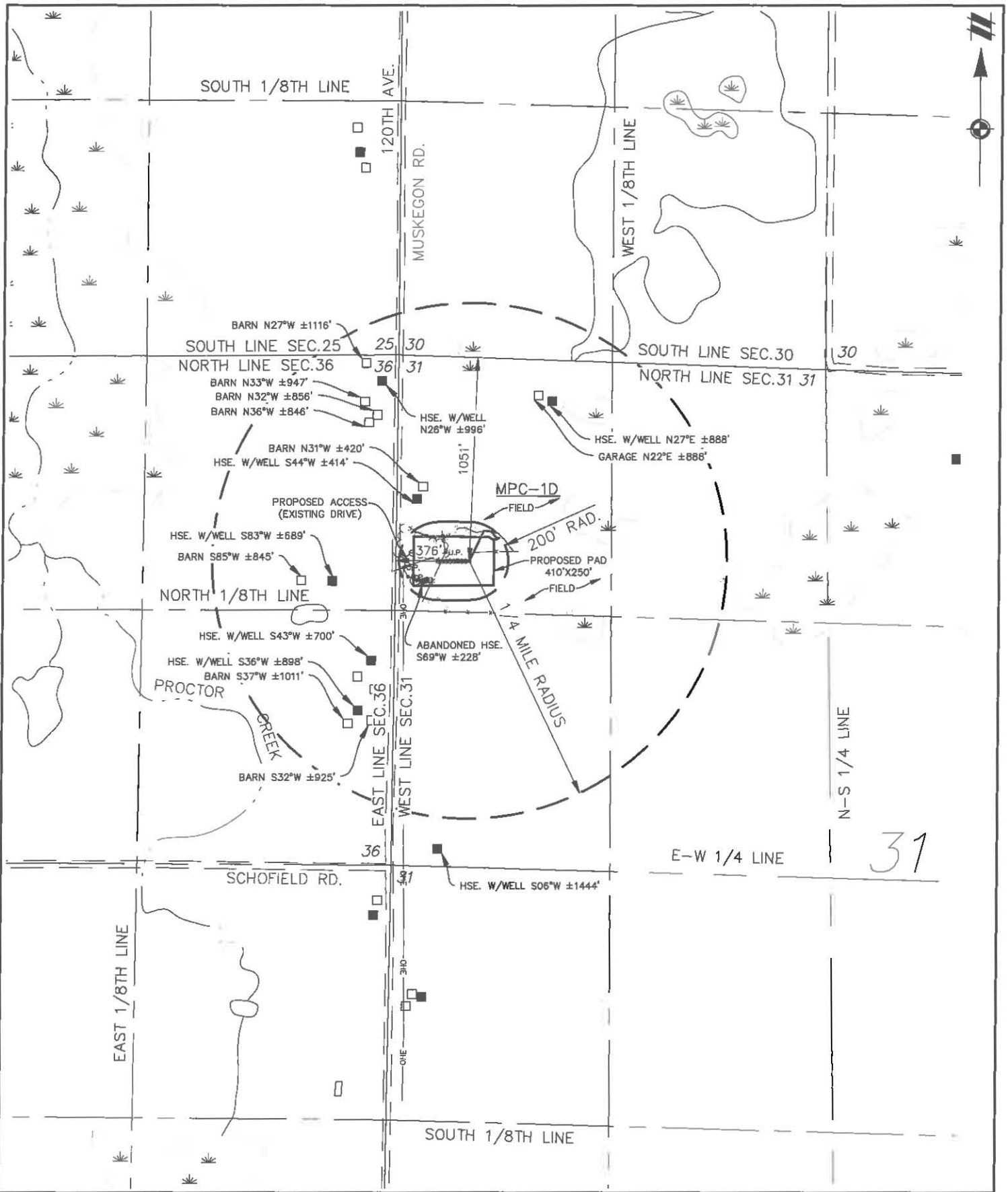
MPC-1D WELL PAD
Section 31, T17N R08W
Evart Twp., Osceola County

Michigan Potash Company, LLC intends to file for a drilling permit with the Michigan Department of Environmental Quality (MDEQ) for the above referenced well. The intended well is to be used for the disposal of brine resulting from the production of potash in the area. An injection permit will also be filed with the USEPA. In addition to this well, there will also be eight (8) other proposed injection wells to be drilled for the production of potash on the same pad. For purposes of this review, we have identified a well pad which includes all 9 wells.

The proposed well pad is located in an open dormant field surrounded by wooded and/or low lying areas. The ground slopes range from 0% to 7% over the proposed pad area. The soils are primarily sandy loam. Access to the site will be from 120th Ave. on the west side of Section 31, using an existing entrance drive. There is an abandoned house in the southwest corner of the proposed pad area which is to be removed prior to pad construction.

The project will involve the construction of a well pad for drilling purposes. The pad area required for this operation is approximately 410 feet by 250 feet centered about the well locations. The topsoil will be stripped and stockpiled on site for future restoration. The site will be graded with a minimal slope to allow for drainage. In this case a moderate amount of grading will be needed in order to balance the site. Once the subgrade is prepared, gravel will be placed over the pad area. An in ground pit will be constructed to contain the drilling fluids and cuttings during the drilling operation. The existing entrance will be utilized as the access road, no new construction will be needed for this. Soil erosion and sedimentation control measures will be utilized as needed to control runoff.

A drilling rig will be set up to complete the drilling. The drilling operation involves the use of a large rotary drill rig with numerous support facilities. The drilling and associated equipment will utilize most of the pad area. Heavy trucks will deliver the rig components and there will be a variety of support services required during the drilling operation. Upon completion of drilling, the rig will be removed and the site will be restored except for the portion required for production related equipment and maintenance. Once the production equipment is installed, there will be minimal traffic and activity associated with the on-going operation and maintenance of the well.



AREA OF POTENTIAL EFFECTS: MPC 1D SEC. 31, T17N-R8W EVART TWP. OSCEOLA COUNTY, MICHIGAN	DATE: 12/22/14 DRN: SJV	ATWELL 866.850.4200 | www.atwell-group.com 7192 EAST 34 ROAD, SUITE 4 CADILLAC, MI 49601 231.775.3000
CLIENT: MICHIGAN POTASH OPERATING	SCALE: 1"=660'	F.B. 1427 PAGE. 10 | SHEET 1 OF 1 | JOB NO.: 14001984.01

K:\14001984.01 - MPC 1D\DWG\PLAN SETS\OIL-GAS DRAWINGS\14001984-01 MPC-1D AREA OF POTENTIAL EFFECTS.DWG 12/23/2014 12:36 PM

ATWELL

Area of Potential Effects

MPC-1D Well Pad
Section 31, T17N R08W
Evart Twp., Osceola County

It is our opinion that the Area of Potential Effects (APE) will vary depending upon the aspect being considered so each aspect will be addressed separately in the following paragraphs.

The physical APE can be identified and limited to the disturbance of the ground associated with the improvements of the access road and construction of the drilling pad. For this project, a 410' x 250' drilling pad will be constructed. All ground disturbance associated with this project will be contained within this area. An existing entrance drive will be utilized as the access road and no changes are anticipated.

The visual APE takes into consideration both the short term and long term characteristics of the project. The site is located in an open dormant field adjacent to an abandoned house. The surrounding area is a mixture of woodlots, low lying land and cultivated fields. The terrain is moderately rolling at the site. Due to the nature of the surrounding terrain, the visual APE should not exceed the one quarter mile range for the short term during the drilling operation. In the long term, once the site has been restored we expect the visual APE will be reduced to a shorter distance immediately adjacent to the facility. The site is visible from 120th Ave.

The auditory APE will be a short term issue primarily attributed to the pad construction and drilling operations. The construction activities typically take place over the course of a 2 week period. Drilling activities associated with all nine (9) wells could extend over of period of five (5) months. The increased noise level may impact an area having a radius of up to 500 feet from the well site depending upon the field conditions. However once the well is completed and construction activities cease, the auditory APE will be reduced to a very short distance immediately adjacent to the facility as there will be no source of noise at the site.

The sociocultural APE is considered to be of minimal effect relative to this project. This proposed project is a relatively minor event, has a short duration and only impacts one landowner. The proposed site was selected in cooperation with the landowner. The nearest residence is approximately 300 feet away. The area is rural in nature with only a few residences in the surrounding area. There will be a noticeable increase in traffic during the construction/drilling process but it will diminish significantly once the wells are completed. For the long term there will be a very small amount of daily traffic resulting from this project. The APE for this aspect is felt to be contained within a one quarter mile radius of the well.

These boundaries are identified and denoted based upon our past experience working in the field in and around these types of projects. It is our opinion that these boundaries reflect the practical APE for this project. We have assumed for purposes of this review that the primary APE will include a 200' radius around the well and a temporary or secondary APE will include a ¼ mile radius from the well during development.

Photo 1 – At stake facing South

Photo 2 – At stake facing West

Photographs depict the subject site at the time they were taken. Their material content has not been altered. Some formatting of size, brightness or contrast may have occurred to improve viewing of details.

Phone: (231) 775-3000
Fax: (231) 775-7334
Website: http://.www.atwell-group.com

SITE PHOTOS – SHEET 1 of 2

MPC-1D Well Pad
Section 31, T17N, R08W
Evart Twp.
Osceola County, Michigan

PHOTOGRAPHED BY: GS
DATE: 12-23-14

Photo 3 – At stake facing North

Photo 4 – At stake facing East

Photographs depict the subject site at the time they were taken. Their material content has not been altered. Some formatting of size, brightness or contrast may have occurred to improve viewing of details.

Phone: (231) 775-3000
Fax: (231) 775-7334
Website: http://www.atwell-group.com

SITE PHOTOS – SHEET 2 of 2

MPC-1D Well Pad
Section 31, T17N, R08W
Evart Twp.
Osceola County, Michigan

PHOTOGRAPHED BY: GS
DATE: 12-23-14

ATWELL

January 13, 2015

Mr. Brian Conway
State Historic Preservation Office
Environmental Review Office
Michigan Historical Center
702 W. Kalamazoo Street, P.O. Box 30740
Lansing, MI 48909-8240

RE: Section 106 Review Request
New Underground Injection Well Location
Well Name: MPC-2D
T17N, R08W, Sec. 31, NW¼, NW¼, 1050' FNL, 396' FWL
Evart Township, Osceola County

Dear Mr. Conway,

Michigan Potash Company is proposing to drill a new underground injection well as referenced above. In order to apply for a United States Environmental Protection Agency (USEPA) permit for an underground injection well, the USEPA regulations require a determination that the injection well will not impact any properties listed or eligible for listing in the National Register of Historic Places. Enclosed, please find a completed Section 106 review application pertaining to the proposed well along with the required attachments. Please feel free to contact our office if you should have any questions.

We request that you make your reply directly to:

WU-16J
US EPA
Region 5
77 W. Jackson Bld.
Chicago, IL 60604

With a copy to: Atwell
Attn. J. Dean Geers
7192 E. 34 Road, Suite 4
Cadillac, MI 49601

We wish to thank you in advance for your timely review of this matter.

Respectfully,
ATWELL

J. Dean Geers, P.S. Project Manager

Enclosures

cc: Atwell File 14001984.02

STATE HISTORIC PRESERVATION OFFICE
Application for Section 106 Review

SHPO Use Only					
☐ IN	Received Date	___ / ___ / ___	Log In Date	___ / ___ / ___
☐ OUT	Response Date	___ / ___ / ___	Log Out Date	___ / ___ / ___
	Sent Date	___ / ___ / ___		

Submit one copy for each project for which review is requested. This application is required. Please type. Applications must be complete for review to begin. Incomplete applications will be sent back to the applicant without comment. Send only the information and attachments requested on this application. Materials submitted for review cannot be returned. Due to limited resources we are unable to accept this application electronically.

I. GENERAL INFORMATION

☒ THIS IS A NEW SUBMITTAL ☐ THIS IS MORE INFORMATION RELATING TO ER#

- ☐ Funding Notice
- ☐ Survey
- ☐ MOA or PA
- ☒ Other: Brine disposal well

a. Project Name: MPC-2D Well
b. Project Address (if available): N/A-Project lies in the NW 1/4, NW 1/4 of Section 31, T17N, R08W
c. Municipal Unit: Evart Twp. County: Osceola Co
d. Federal Agency and Contact (*If you do not know the federal agency involved in your project please contact the party requiring you to apply for Section 106 review, not the SHPO, for this information.*): USEPA Region 5
e. State Agency and Contact (if applicable): MDEQ Cadillac Office
f. Consultant or Applicant Contact Information (if applicable): Michigan Potash Company

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II. GROUND DISTURBING ACTIVITY (INCLUDING EXCAVATION, GRADING, TREE REMOVALS, UTILITY INSTALLATION, ETC.)

DOES THIS PROJECT INVOLVE GROUND-DISTURBING ACTIVITY? ☒ YES ☐ NO (If no, proceed to section **III.**)

Exact project location must be submitted on a USGS Quad map (portions, photocopies of portions, and electronic USGS maps are acceptable as long as the location is clearly marked).

a. USGS Quad Map Name: Chippewa Lake North, Michigan
b. Township: 17N Range: 08W Section: 31
c. Description of width, length and depth of proposed ground disturbing activity: 430'L x 250'W x 4'D
d. Previous land use and disturbances: Cultivated Field
e. Current land use and conditions: Dormant Field
f. Does the landowner know of any archaeological resources found on the property? NO
   Please describe:

III. PROJECT WORK DESCRIPTION AND AREA OF POTENTIAL EFFECTS (APE)
Note: Every project has an APE.

a. Provide a detailed written description of the project (plans, specifications, Environmental Impact Statements (EIS), Environmental Assessments (EA), etc. **cannot** be substituted for the written description): See attached
b. Provide a localized map indicating the location of the project; road names must be included and legible.
c. On the above-mentioned map, identify the APE.
d. Provide a written description of the APE (physical, visual, auditory, and sociocultural), the steps taken to identify the APE, and the justification for the boundaries chosen. See attached

IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. List and date **all** properties 50 years of age or older located in the APE. If the property is located within a National Register eligible, listed or local district it is only necessary to identify the district: There are no structures over 50 years of age within the 200' APE.
b. Describe the steps taken to identify whether or not any **historic** properties exist in the APE and include the level of effort made to carry out such steps: Site visit, check of historical registry, inquire of landowner, no known event of common knowledge
c. Based on the information contained in "b", please choose one:
   - ☐ Historic Properties Present in the APE
   - ☒ No Historic Properties Present in the APE
d. Describe the condition, previous disturbance to, and history of any historic properties located in the APE: N/A

V. PHOTOGRAPHS

Note: All photographs must be keyed to a localized map, and should be included as an attachment to this application.

a. Provide photographs of the site itself.
b. Provide photographs of all properties 50 years of age or older located in the APE (faxed or photocopied photographs are not acceptable).

VI. DETERMINATION OF EFFECT

☒ No historic properties affected based on [36 CFR § 800.4(d)(1)], please provide the basis for this determination.

There is no hisstoric structures or objects, no information in the historical registry, no historical event known to take place and no other indication that historic properties lie within the physical APE.

☐ No Adverse Effect [36 CFR § 800.5(b)] on historic properties, explain why the criteria of adverse effect, 36 CFR Part 800.5(a)(1), were found not applicable.

☐ Adverse Effect [36 CFR § 800.5(d)(2)] on historic properties, explain why the criteria of adverse effect, [36 CFR Part 800.5(a)(1)], were found applicable.

Please print and mail completed form and required information to:

State Historic Preservation Office, Environmental Review Office, Michigan Historical Center, 702 W. Kalamazoo Street, P.O. Box 30740, Lansing, MI 48909-8240

ATWELL

Project Work Description

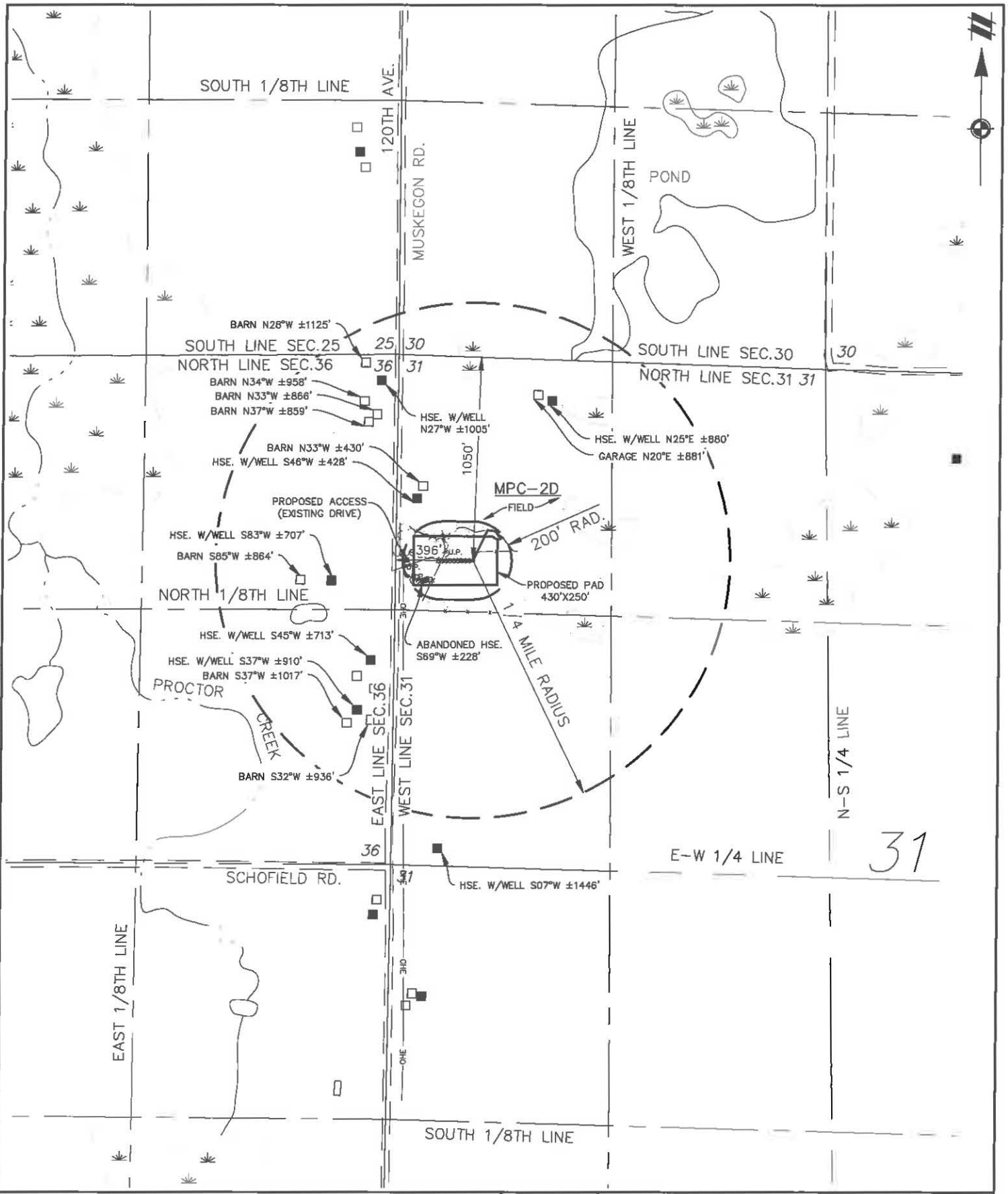
MPC-2D WELL
Section 31, T17N R08W
Evart Twp., Osceola County

Michigan Potash Company, LLC intends to file for a drilling permit with the Michigan Department of Environmental Quality (MDEQ) for the above referenced well. The intended well is to be used for the disposal of brine resulting from the production of potash in the area. An injection permit will also be filed with the USEPA. In addition to this well, there will also be one (1) other disposal well and eight (8) other injection wells proposed to be drilled for the production of potash on the same pad. For purposes of this review, we have identified a well pad which includes all 10 wells.

The proposed well pad is located in an open dormant field surrounded by wooded and/or low lying areas. The ground slopes range from 0% to 7% over the proposed pad area. The soils are primarily sandy loam. Access to the site will be from 120th Ave. on the west side of Section 31, using an existing entrance drive. There is an abandoned house in the southwest corner of the proposed pad area which is to be removed prior to pad construction.

The project will involve the construction of a well pad for drilling purposes. The pad area required for this operation is approximately 410 feet by 250 feet centered about the well locations. The topsoil will be stripped and stockpiled on site for future restoration. The site will be graded with a minimal slope to allow for drainage. In this case a moderate amount of grading will be needed in order to balance the site. Once the subgrade is prepared, gravel will be placed over the pad area. An in ground pit will be constructed to contain the drilling fluids and cuttings during the drilling operation. The existing entrance will be utilized as the access road, no new construction will be needed for this. Soil erosion and sedimentation control measures will be utilized as needed to control runoff.

A drilling rig will be set up to complete the drilling. The drilling operation involves the use of a large rotary drill rig with numerous support facilities. The drilling and associated equipment will utilize most of the pad area. Heavy trucks will deliver the rig components and there will be a variety of support services required during the drilling operation. Upon completion of drilling, the rig will be removed and the site will be restored except for the portion required for production related equipment and maintenance. Once the production equipment is installed, there will be minimal traffic and activity associated with the on-going operation and maintenance of the well.



AREA OF POTENTIAL EFFECTS: MPC-2D
SEC. 31, T17N-R8W
EVART TWP.
OSCEOLA COUNTY, MICHIGAN

DATE: 1/13/15

DRN: SJV

SCALE: 1"=660'

CLIENT: MICHIGAN POTASH COMPANY

ATWELL
866.850.4200 | www.atwell-group.com
7192 EAST 34 ROAD, SUITE 4
CADILLAC, MI 49601
231.775.3000

F.B.	1427	SHEET	JOB NO.:
PAGE.	10	1 OF 1	14001984.02

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ATWELL

Area of Potential Effects

MPC-2D Well
Section 31, T17N R08W
Evart Twp., Osceola County

It is our opinion that the Area of Potential Effects (APE) will vary depending upon the aspect being considered so each aspect will be addressed separately in the following paragraphs.

The physical APE can be identified and limited to the disturbance of the ground associated with the improvements of the access road and construction of the drilling pad. For this project, a 430' x 250' drilling pad will be constructed to accommodate multiple wells. All ground disturbance associated with this project will be contained within this area. An existing entrance drive will be utilized as the access road and no changes are anticipated.

The visual APE takes into consideration both the short term and long term characteristics of the project. The site is located in an open dormant field adjacent to an abandoned house. The surrounding area is a mixture of woodlots, low lying land and cultivated fields. The terrain is moderately rolling at the site. Due to the nature of the surrounding terrain, the visual APE should not exceed the one quarter mile range for the short term during the drilling operation. In the long term, once the site has been restored we expect the visual APE will be reduced to a shorter distance immediately adjacent to the facility. The site is visible from 120th Ave.

The auditory APE will be a short term issue primarily attributed to the pad construction and drilling operations. The construction activities typically take place over the course of a 2 week period. Drilling activities associated with all ten (10) wells could extend over of period of five (5) months. The increased noise level may impact an area having a radius of up to 500 feet from the well site depending upon the field conditions. However once the well is completed and construction activities cease, the auditory APE will be reduced to a very short distance immediately adjacent to the facility as there will be no source of noise at the site.

The sociocultural APE is considered to be of minimal effect relative to this project. This proposed project is a relatively minor event, has a short duration and only impacts one landowner. The proposed site was selected in cooperation with the landowner. The nearest residence is approximately 300 feet away. The area is rural in nature with only a few residences in the surrounding area. There will be a noticeable increase in traffic during the construction/drilling process but it will diminish significantly once the wells are completed. For the long term there will be a very small amount of daily traffic resulting from this project. The APE for this aspect is felt to be contained within a one quarter mile radius of the well.

These boundaries are identified and denoted based upon our past experience working in the field in and around these types of projects. It is our opinion that these boundaries reflect the practical APE for this project. We have assumed for purposes of this review that the primary APE will include a 200' radius around the well and a temporary or secondary APE will include a ¼ mile radius from the well during development.

Photo 1 – At stake facing South

Photo 2 – At stake facing West

Photographs depict the subject site at the time they were taken. Their material content has not been altered. Some formatting of size, brightness or contrast may have occurred to improve viewing of details.

Phone: (231) 775-3000
Fax: (231) 775-7334
Website: http://.www.atwell-group.com

SITE PHOTOS – SHEET 1 of 2

MPC-2D Well
Section 31, T17N, R08W
Evart Twp.
Osceola County, Michigan

PHOTOGRAPHED BY: GS
DATE: 12-23-14

Photo 3 – At stake facing North

Photo 4 – At stake facing East

Photographs depict the subject site at the time they were taken. Their material content has not been altered. Some formatting of size, brightness or contrast may have occurred to improve viewing of details.

Phone: (231) 775-3000
Fax: (231) 775-7334
Website: http://www.atwell-group.com

SITE PHOTOS – SHEET 2 of 2

MPC-2D Well
Section 31, T17N, R08W
Evart Twp.
Osceola County, Michigan

PHOTOGRAPHED BY: GS
DATE: 12-23-14

ATWELL

December 23, 2014

Mr. Brian Conway
State Historic Preservation Office
Environmental Review Office
Michigan Historical Center
702 W. Kalamazoo Street, P.O. Box 30740
Lansing, MI 48909-8240

RE: Section 106 Review Request
New Underground Injection Well Location
Well Name: MPC-3D
T17N, R09W, Sec. 36, NE¼, SE¼, 1454' FSL, 442' FEL
Hersey Township, Osceola County

Dear Mr. Conway,

Michigan Potash Company is proposing to drill a new underground injection well as referenced above. In order to apply for a United States Environmental Protection Agency (USEPA) permit for an underground injection well, the USEPA regulations require a determination that the injection well will not impact any properties listed or eligible for listing in the National Register of Historic Places. Enclosed, please find a completed Section 106 review application pertaining to the proposed well along with the required attachments. Please feel free to contact our office if you should have any questions.

We request that you make your reply directly to:

USEPA
Region 5
77 W. Jackson Bld.
Chicago, IL 60604

With a copy to: Atwell
Attn. J. Dean Geers
7192 E. 34 Road, Suite 4
Cadillac, MI 49601

We wish to thank you in advance for your timely review of this matter.

Respectfully,
ATWELL

J. Dean Geers, P.S. Project Manager

Enclosures

cc: Atwell File 14001984.03

STATE HISTORIC PRESERVATION OFFICE
Application for Section 106 Review

SHPO Use Only					
☐ IN	Received Date	___ / ___ / ___	Log In Date	___ / ___ / ___
☐ OUT	Response Date	___ / ___ / ___	Log Out Date	___ / ___ / ___
	Sent Date	___ / ___ / ___		

Submit one copy for each project for which review is requested. This application is required. Please type. Applications must be complete for review to begin. Incomplete applications will be sent back to the applicant without comment. Send only the information and attachments requested on this application. Materials submitted for review cannot be returned. Due to limited resources we are unable to accept this application electronically.

I. GENERAL INFORMATION

☒ THIS IS A NEW SUBMITTAL ☐ THIS IS MORE INFORMATION RELATING TO ER#

- ☐ Funding Notice
- ☐ Survey
- ☐ MOA or PA
- ☒ Other: Brine disposal well

a. Project Name: MPC-3D
b. Project Address (if available): N/A-Project lies in the NE 1/4, SE 1/4 of Section 36, T17N, R09W
c. Municipal Unit: Hersey Twp. County: Osceola Co
d. Federal Agency and Contact (*If you do not know the federal agency involved in your project please contact the party requiring you to apply for Section 106 review, not the SHPO, for this information.*): USEPA Region 5
e. State Agency and Contact (if applicable): MDEQ Cadillac Office
f. Consultant or Applicant Contact Information (if applicable): Michigan Potash Company

---

II. GROUND DISTURBING ACTIVITY (INCLUDING EXCAVATION, GRADING, TREE REMOVALS, UTILITY INSTALLATION, ETC.)

DOES THIS PROJECT INVOLVE GROUND-DISTURBING ACTIVITY? ☒ YES ☐ NO (If no, proceed to section III.)

Exact project location must be submitted on a USGS Quad map (portions, photocopies of portions, and electronic USGS maps are acceptable as long as the location is clearly marked).

a. USGS Quad Map Name: Chippewa Lake North, Michigan
b. Township: 17N Range: 09W Section: 36
c. Description of width, length and depth of proposed ground disturbing activity: 250'L x 250'W x 4'D
d. Previous land use and disturbances: Cultivated Field
e. Current land use and conditions: Cultivated Field
f. Does the landowner know of any archaeological resources found on the property? NO
   Please describe:

III. PROJECT WORK DESCRIPTION AND AREA OF POTENTIAL EFFECTS (APE)
Note: Every project has an APE.

a. Provide a detailed written description of the project (plans, specifications, Environmental Impact Statements (EIS), Environmental Assessments (EA), etc. **cannot** be substituted for the written description): See attached
b. Provide a localized map indicating the location of the project; road names must be included and legible.
c. On the above-mentioned map, identify the APE.
d. Provide a written description of the APE (physical, visual, auditory, and sociocultural), the steps taken to identify the APE, and the justification for the boundaries chosen. See attached

IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. List and date **all** properties 50 years of age or older located in the APE. If the property is located within a National Register eligible, listed or local district it is only necessary to identify the district: There are no structures over 50 years of age within the 200' APE.
b. Describe the steps taken to identify whether or not any **historic** properties exist in the APE and include the level of effort made to carry out such steps: Site visit, check of historical registry, inquire of landowner, no known event of common knowledge
c. Based on the information contained in "b", please choose one:
   - ☐ Historic Properties Present in the APE
   - ☒ No Historic Properties Present in the APE
d. Describe the condition, previous disturbance to, and history of any historic properties located in the APE: N/A

V. PHOTOGRAPHS

Note: All photographs must be keyed to a localized map, and should be included as an attachment to this application.

a. Provide photographs of the site itself.
b. Provide photographs of all properties 50 years of age or older located in the APE (faxed or photocopied photographs are not acceptable).

VI. DETERMINATION OF EFFECT

☒ No historic properties affected based on [36 CFR § 800.4(d)(1)], please provide the basis for this determination.

There is no hisstoric structures or objects, no information in the historical registry, no historical event known to take place and no other indication that historic properties lie within the physical APE.

☐ No Adverse Effect [36 CFR § 800.5(b)] on historic properties, explain why the criteria of adverse effect, 36 CFR Part 800.5(a)(1), were found not applicable.

☐ Adverse Effect [36 CFR § 800.5(d)(2)] on historic properties, explain why the criteria of adverse effect, [36 CFR Part 800.5(a)(1)], were found applicable.

Please print and mail completed form and required information to:

State Historic Preservation Office, Environmental Review Office, Michigan Historical Center, 702 W. Kalamazoo Street, P.O. Box 30740, Lansing, MI 48909-8240

ATWELL

Project Work Description

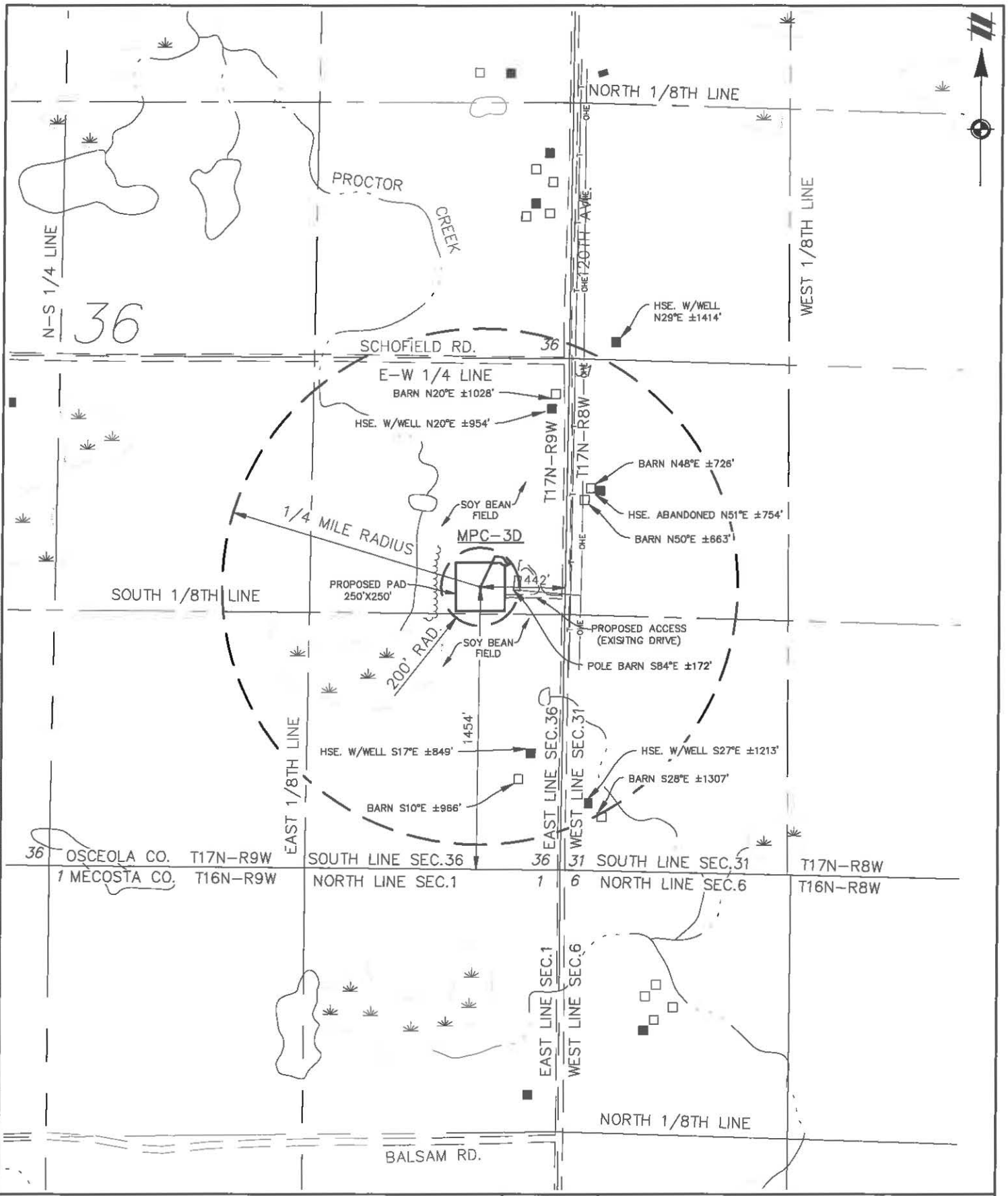
MPC-3D
Section 36, T17N R09W
Hersey Twp., Osceola County

Michigan Potash Company, LLC intends to file for a drilling permit with the Michigan Department of Environmental Quality (MDEQ) for the above referenced well. The intended well is to be used for the disposal of brine resulting from the production of potash in the area. An injection permit will also be filed with the USEPA.

The proposed well is located in an open cultivated field surrounded by wooded and/or low lying areas. The ground slopes range from 0% to 10% over the proposed pad area. The soils are primarily sandy loam. Access to the site will be from 120th Ave. on the east side of Section 36, using an existing entrance drive. There is an existing pole building ±170' east of the stake.

The project will involve the construction of a well pad for drilling purposes. The pad area typically required for this operation is approximately 250 feet by 250 feet centered about the well location. The topsoil will be stripped and stockpiled on site for future restoration. The site will be graded with a minimal slope to allow for drainage. In this case a moderate amount of grading will be needed in order to balance the site. Once the subgrade is prepared, gravel will be placed over the pad area. An in ground pit will be constructed to contain the drilling fluids and cuttings during the drilling operation. The existing entrance will be utilized as the access road, no new construction will be needed for this. Soil erosion and sedimentation control measures will be utilized as needed to control runoff.

A drilling rig will be set up to complete the drilling. The drilling operation involves the use of a large rotary drill rig with numerous support facilities. The drilling and associated equipment will utilize most of the pad area. Heavy trucks will deliver the rig components and there will be a variety of support services required during the drilling operation. Upon completion of drilling, the rig will be removed and the site will be restored except for the portion required for production related equipment and maintenance. Once the production equipment is installed, there will be minimal traffic and activity associated with the on-going operation and maintenance of the well.



AREA OF POTENTIAL EFFECTS: MPC-3D SEC. 36, T17N-R9W HERSEY TWP. OSCEOLA COUNTY, MICHIGAN	DATE: 12/22/14 DRN: SJV	ATWELL 866.830.4200 | www.atwell-group.com 7182 EAST 34 ROAD, SUITE 4 CADILLAC, MI 49601 231.775.3000
CLIENT: MICHIGAN POTASH COMPANY	SCALE: 1"=660'	F.B. 1427 PAGE. 7 | SHEET 1 OF 1 | JOB NO.: 14001984.03

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ATWELL

Area of Potential Effects

MPC-3D
Section 36, T17N R09W
Hersey Twp., Osceola County

It is our opinion that the Area of Potential Effects (APE) will vary depending upon the aspect being considered so each aspect will be addressed separately in the following paragraphs.

The physical APE can be identified and limited to the disturbance of the ground associated with the improvements of the access road and construction of the drilling pad. For this project, a 250' x 250' drilling pad will be constructed. All ground disturbance associated with this project will be contained within this area. An existing entrance drive will be utilized as the access road and no changes are anticipated.

The visual APE takes into consideration both the short term and long term characteristics of the project. The site is located in an open cultivated field adjacent to a pole building. The surrounding area is a mixture of woodlots, low lying land and cultivated field. The terrain is moderately rolling at the site. Due to the nature of the surrounding terrain, the visual APE should not exceed the one quarter mile range for the short term during the drilling operation. In the long term, once the site has been restored we expect the visual APE will be reduced to a shorter distance immediately adjacent to the facility. The site is partially visible from 120th Ave.

The auditory APE will be a short term issue primarily attributed to the pad construction and drilling operations. These activities typically take place over the course of a 60 day period. The increased noise level may impact an area having a radius of up to 500 feet from the well site depending upon the field conditions. However once the well is completed and construction activities cease, the auditory APE will be reduced to a very short distance immediately adjacent to the facility as there will be no source of noise at the site.

The sociocultural APE is considered to be of minimal effect relative to this project. This proposed project is a very minor event, has a short duration and only impacts one landowner. The proposed site was selected in cooperation with the landowner. The nearest residence is approximately 750 feet away and not visible from the site. The area is rural in nature with only a few residences in the area. There will be a noticeable increase in traffic during the construction/drilling process but it will diminish significantly once the well is completed. For the long term there will be a very small amount of daily traffic resulting from this project. The APE for this aspect is felt to be contained within a one quarter mile radius of the well.

These boundaries are identified and denoted based upon our past experience working in the field in and around these types of projects. It is our opinion that these boundaries reflect the practical APE for this project. We have assumed for purposes of this review that the primary APE will include a 200' radius around the well and a temporary or secondary APE will include a ¼ mile radius from the well during development.

Photo 1 – At stake facing South

Photo 2 – At stake facing West

Photographs depict the subject site at the time they were taken. Their material content has not been altered. Some formatting of size, brightness or contrast may have occurred to improve viewing of details.

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SITE PHOTOS – SHEET 1 of 2

MPC-3D
Section 36, T17N, R09W
Hersey Twp.
Osceola County, Michigan

PHOTOGRAPHED BY: GS
DATE: 12-15-14

Photo 3 – At stake facing North

Photo 4 – At stake facing East

Photographs depict the subject site at the time they were taken. Their material content has not been altered. Some formatting of size, brightness or contrast may have occurred to improve viewing of details.

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SITE PHOTOS – SHEET 2 of 2

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