October 28, 2020 Project No. 20374351

Tim Unseld, P.E.
Michigan Department of Environment, Great Lakes, and Energy
Grand Rapids District Office
350 Ottawa Avenue NW, 5th Floor, Unit 10
Grand Rapids, MI 49503-2341

REQUEST FOR MIXING ZONE BASED CRITERIA
INACTIVE J.B. SIMS GENERATING STATION
1231 N 3RD ST, GRAND HAVEN, MI 49417

Mr. Unseld:

On behalf of the Grand Haven Board of Light and Power (GHBLP), Golder Associates Inc. (Golder) has prepared the attached Request for Mixing Zone-Based Criteria for the referenced facility. Following discussions with the Michigan Department of Environment, Great Lakes and Energy (EGLE) and US Environmental Protection Agency during August 2020, Golder and GHBLP agree that closure of J.B. Sims Generating Station (Sims) Units 1/2 Impoundment via removal will be impracticable due to high water table conditions and the inability to differentiate between J.B. Sims and the ubiquitous older ash that underlies Units 1/2 and much of the other portions of Harbor Island where ash was used as fill. GHBLP is submitting this closure demonstration, as recommended by Golder, that complies with the provisions provided in Section 20120e(1)(c) of Act 451 P.A. 1994 as amended, by establishing a monitored mixing zone immediately upgradient of the groundwater-surface water interface (GSI) with the Grand River, downgradient of the Sims impoundments.

This request has been prepared using EGLE Form EQP4483; it contains supporting data, including maps depicting the facility location, hydrogeologic conditions beneath Sims (including the occurrence of older ash and waste materials), groundwater flow directions under normal hydraulic conditions, and the proposed 1,900-foot-long GSI based on those flow conditions.

We have summarized groundwater quality from the four monitor wells located along the proposed GSI (MW-3, MW-4, MW-9, and MW-10) in relation to published Part 201 Generic GSI criteria and to the Final Chronic and Acute Values (FCVs/FAVs) developed under Rule 1057 of Part 31. These values are displayed on the supporting tables; EQP 4483 further summarizes the representative maximum expected constituent concentrations in the GSI wells based on quarterly monitoring since June 2017, during which time no FAVs have been exceeded for constituents that can be attributed as being derived from coal ash. The EGLE's drought flow projections for the North Channel of the Grand River are contained in Attachment B to EQP4483; please let Golder know if these need to be updated.

Golder Associates Inc.
15851 South US 27, Suite 50, Lansing, Michigan, USA 48906 T: +1 517 482-2262 F: +1 517 482-2460

Golder and the GHBLP appreciate the EGLE's consideration of this request. Please contact the GHBLP or either of the undersigned if you need additional information or have questions regarding the attached content.

Sincerely,

Golder Associates Inc.

David P. Regalbuto, C.P.G
Associate and Senior Hydrogeologist

Tiffany D. Johnson, P.E.
Principal and Certifying Engineer

DPR/TDJ

CC: Erik Booth, P.E. – GHBLP
Paul Cederquist – GHBLP
David Walters – GHBLP
Arthur Siegal – Jaffe, Raitt Heuer & Weiss, P.C.

Attachments: Form EQP4483 – Request for Mixing Zone-Based Criteria
Figures 1 through 7
Tables 1 through 4
Attachment A – Groundwater Monitoring System Certification
Attachment B – EGLE Low Flow Discharge Records

Michigan Department of Environmental Quality
Remediation and Redevelopment Division
PO Box 30426, LANSING, MI 48909-7926, Phone 517-284-5087, Fax 517-241-9581

REQUEST FOR MIXING ZONE-BASED GSI CRITERIA

This form should be completed with appropriate information, documentation, or narrative to provide the necessary information for the DEQ to process the request. Original sources of information, if not supplied, should be appended or clearly referenced.

Facility Characteristics:

1. The name of the receiving surface water body and the location of the venting groundwater contaminant plume:

Grand River at west end of Harbor Island (Grand Haven Board of Light and Power - JB Sims Generating Station)

This is a _____ new _____ increased __X__ existing loading.

Recreational Use: __X__ Yes ____ No (if no, provide an explanation of conditions that make recreational use not applicable to site conditions):

Supporting Maps, Figures, Tables:

Figure 1 – Site Location Map
Figure 2 – Site Plan showing:

- JB Sims Generating Station
- Ash Surface Impoundments for Units 1/2 and 3(a/b)
- Adjacent wetland to the east (underlain by waste/fill)
- CCR certified monitor well system (MW-7 as background)
- Proposed 1,900-foot-long mixing zone (west and north of CCR surface impoundments)

Figures 3, 4, 5 – Geologic Cross Section A, B, C (respectively)
Figure 6 – Groundwater Elevation Map – 11/15/2019 (normal gradient: groundwater flow toward Grand River)
Figure 7 – Groundwater Elevation Map – 06/17/2020 (reversed gradient: Grand River recharging groundwater)
Tables 1 through 4 – Monitoring results for MW3, MW-4, MW-9, MW-10 (respectively)

2. The location, nature and chemical characteristics of the source of the groundwater contamination plume:

The plume contains constituents of concern that were derived from either: a) historical ash fill or waste that was placed on the island prior to surface impoundment construction, or b) from JB Sims Ash Surface Impoundment Unit 1/2 (Figure 2). Under normal hydraulic conditions (Figure 6), groundwater downgradient of Surface Impoundment Unit 1/2 migrates to the north/northwest, toward the wetland and is hydraulically contiguous with the Grand River; the plume also migrates westerly from Surface Impoundment Unit 1/2 directly toward the Grand River. During the August 2017 and the March/June 2020 sample events, the gradient was reversed - from the Grand River toward the surface impoundments. This condition of gradient reversal is demonstrated in Figure 7.

Since the installation of the certified CCR multi-unit monitor well network for Units 1/2 and 3a/3b in 2017, CCR constituents/parameters of concern (COCs) have been monitored from monitoring wells MW-1R, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7 (background), MW-8, MW-9, and MW-10. COCs have been detected at concentrations above their respective Part 201 generic groundwater surface water interface (GSI) criteria at: a) source area ash surface impoundments (MW-1R, MW-2, MW-5, and MW-6) and/or b) downgradient of the ash surface impoundments and adjacent to a GSI (MW-3, MW-4, MW-9, and MW-10) including:

Appendix III: boron, chloride, fluoride, sulfate, total dissolved solids (TDS)
Appendix IV: arsenic, barium, lithium

Additionally, other COCs that have been detected above their respective generic GSI criteria **only once** in the wells immediately adjacent to the ash surface impoundments include: total chromium (i.e., GSI criterion based on Cr^{+6}) and lead. Designated CCR background well MW-7 has shown generic GSI exceedences for TDS (500 mg/L) and boron (7.2 mg/L). The groundwater analytical results for the CCR GSI well network (MW-3, MW-4, MW-9, and MW-10) are contained in the attached tables.

3. The name, Chemical Abstract Service (CAS) Number, and worst-case maximum concentration of contaminants predicted to reach GSI are summarized below. Generally, the highest concentration of each contaminant found in the groundwater would be appropriate to represent the worst-case maximum. If source contaminants have not yet reached the groundwater but are expected to do so, source concentrations should be identified and noted as such. Mixing zone based GSI criteria will not be developed for contaminants that are not identified as having a reasonable potential to exceed water quality criteria.

Chemical or General Chemistry Parameter	CAS #	Predicted Worst Case Maximum GSI Discharge Concentration	Average Surface Water Concentration Upstream, if available
boron	7440-42-8	46	
chloride	16887-00-6	660	
fluoride	16984-48-8	11	
sulfate	14808-79-8	1,500	
total dissolved solids	NA	4,100	
barium	7440-39-3	1.8	
lithium	7439-93-2	1.2	

Note: all concentrations reported in units of mg/L

4. The discharge rate of the venting groundwater contaminant plume in cubic feet per second (cfs): **0.19**

This rate is calculated using hydrogeologic and hydraulic input parameters that are contained in the JB Sims *Groundwater Monitoring System Certification*, which was prepared in November 2017 by Thomas O'Connell, P.E. of Environmental Resources Management Michigan, Inc. (ERM). This document is contained in Attachment A. The groundwater venting or flux rate to the Grand River, under normal hydraulic conditions, is calculated as:

Q = K*i*A, where:

K = hydraulic conductivity of the unconfined glacial fine sand aquifer

i = maximum typical hydraulic gradient between the ash ponds and the GSI

A = cross sectional area through which the impacted groundwater (i.e., > generic GSI) discharges

Values for K and i are taken from ERM (2017), including an estimated representative aquifer K of **53 feet/day**, and a maximum horizontal hydraulic gradient of **0.008 feet/day**. Golder proposes a cross sectional area of **38,000 square feet (ft^2)**, which is based on an approximate saturated aquifer thickness of 20 feet (ERM, 2017) and a proposed GSI mixing zone that is 1,900 feet long, as depicted in Figure 2. These input value gives a venting rate of:

(53 ft/day)(0.008)(38,000 ft^2) = **16,112 ft^3/day**, or approximately **0.19 ft^3/sec**

5. The location of other contaminant plumes entering the receiving surface water body, their constituents, and concentrations, if available:

The now closed JB Sims generating station was developed at the west end of Harbor Island. To the east of the JB Sims ash surface impoundments is a wetland, which is typically downgradient of the ash surface impoundments, and which is known to be underlain by waste materials that include municipal solid waste and CCR fill materials that predate JB Sims. MW-7 and MW-8 were installed along the south and north sides of the wetland, respectively, to provide an indication of groundwater quality conditions in areas that may show impacts due to residuals other than JB Sims CCR from Units 1/2 and 3a/3b. These two wells typically show TDS between 500 and 800 mg/L, with boron in MW-7 typically between 9 and 15 mg/L. These affects are considered to reflect leaching from the historical ash fill and/or wastes that underlay the wetland.

6. Surface water flow (see flow records in Attachment B):

Record 8802: Grand River at 43.066667/-86.234722 (MI00058209; 1/14/2016)

The lowest monthly 95 percent exceedance low flow at the discharge location: 1,080 cfs

The harmonic mean flow at the discharge location: 2,750 cfs

The 90dQ10 flow at the discharge location: 1,290 cfs

Record 8803: Grand River North Channel at 43.0775/-86.229167 (MI00058209; 1/14/2016)

The lowest monthly 95 percent exceedance low flow at the discharge location: 1,030 cfs

The harmonic mean flow at the discharge location: 2,610 cfs

The 90dQ10 flow at the discharge location: 1,230 cfs

Source (both): X DEQ Low Flow Database _____ DEQ Hydrologic Studies Unit (memo attached)

The venting plume is located approximately midpoint between the locations for attached records 8802 (North Channel) and 8803 (downstream from North/South Channel confluence). The more representative flow characteristics should be assumed based on 8803, because JB Sims is located upstream from the confluence of the Grand River North and South Channels.

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this request and all attachments thereto 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.

Authorized Signature: _____

Name & Title: David Walters, General Manager

Authorized signatures:

- *For a corporation, a principal executive officer of at least the level of vice president or his designated representative. If the designated representative is responsible for the overall operation of the facility from which the groundwater is venting, the designation of the representative must be in writing from a principal executive officer and provided to the MDEQ.*
- *For a partnership, a general partner.*
- *For a sole proprietorship, the proprietor.*
- *For a state, municipal, or other public facility, either a principal executive officer, the mayor, village president, city or village manager, or other authorized employee designated in writing from a principal executive officer and provided to the MDEQ.*

If this is a new loading, or increased loading above previously authorized levels, an antidegradation demonstration, which includes the information in numbers 8 and 9 below, or a demonstration of qualification for an exemption under Rule 323.1098(7) or (8), is required.

7. Please check whether there is:

_____ an antidegradation demonstration (information for 8 and 9) is included or

_____ a demonstration of qualification for an exemption (Refer to 323.1098(7) or (8) for elements needed for this demonstration).

Please identify who prepared the antidegradation or exemption demonstration:

8. This is a new or increased loading from venting groundwater. The social or economic development and the benefits to the area in which the waters are located that would be foregone if the new or increased discharge is not allowed include:

- Employment increases:
- Production level increases:
- Employment reduction avoidance:
- Efficiency increases:
- Industrial, commercial, or residential growth:
- Economic or social benefits to the community:
- Other relevant factors:

If the new or increased loading includes the following bioaccumulative chemicals of concern (BCCs), Chlordane, 4,4'-Dichlorodiphenyldichloroethane, 4,4'-Dichlorodiphenyldichloroethylene, 4,4'-Dichlorodiphenyltrichloroethane, Dieldrin, Hexachlorbenzene, Hexachlorobutadiene, Hexachlorocyclohexanes, alpha-Hexachlorocyclohexane, beta-Hexachlorcyclohexane, delta-Hexachlorocyclohexane, Lindane, Mercury, Mirex, Octachlorostyrene, Polychlorinated biphenyls, Pentachlorobenzene, Photomirex, 2,3,7,8-Tetrachlorodibenzodioxin, 1,2,3,4-Tetrachlorobenzene, 1,2,4,5-Tetrachlorobenzene, Toxaphene, complete the following:

9. Please check whether:

____There is no BCC in the discharge. _____ BCCs are included in the discharge (information for 10 and 11 is included)

10. The alternatives evaluated and the alternatives to be implemented that will comply with minimizing the discharge of the BCC by implementation of any cost-effective pollution prevention alternatives (such as source control) and techniques reasonably available that would eliminate or significantly reduce the discharge of the BCC are:

11. If pollution prevention alternatives would not eliminate the increased discharge of the BCC, the person making the demonstration must evaluate alternative or enhanced groundwater treatment techniques that would eliminate the discharge of the BCC. The techniques that have a cost that are reasonable relative to the cost of treatment necessary to achieve generic GSI criteria must be implemented. The alternatives evaluated and the alternatives to be implemented that will comply with this requirement are:

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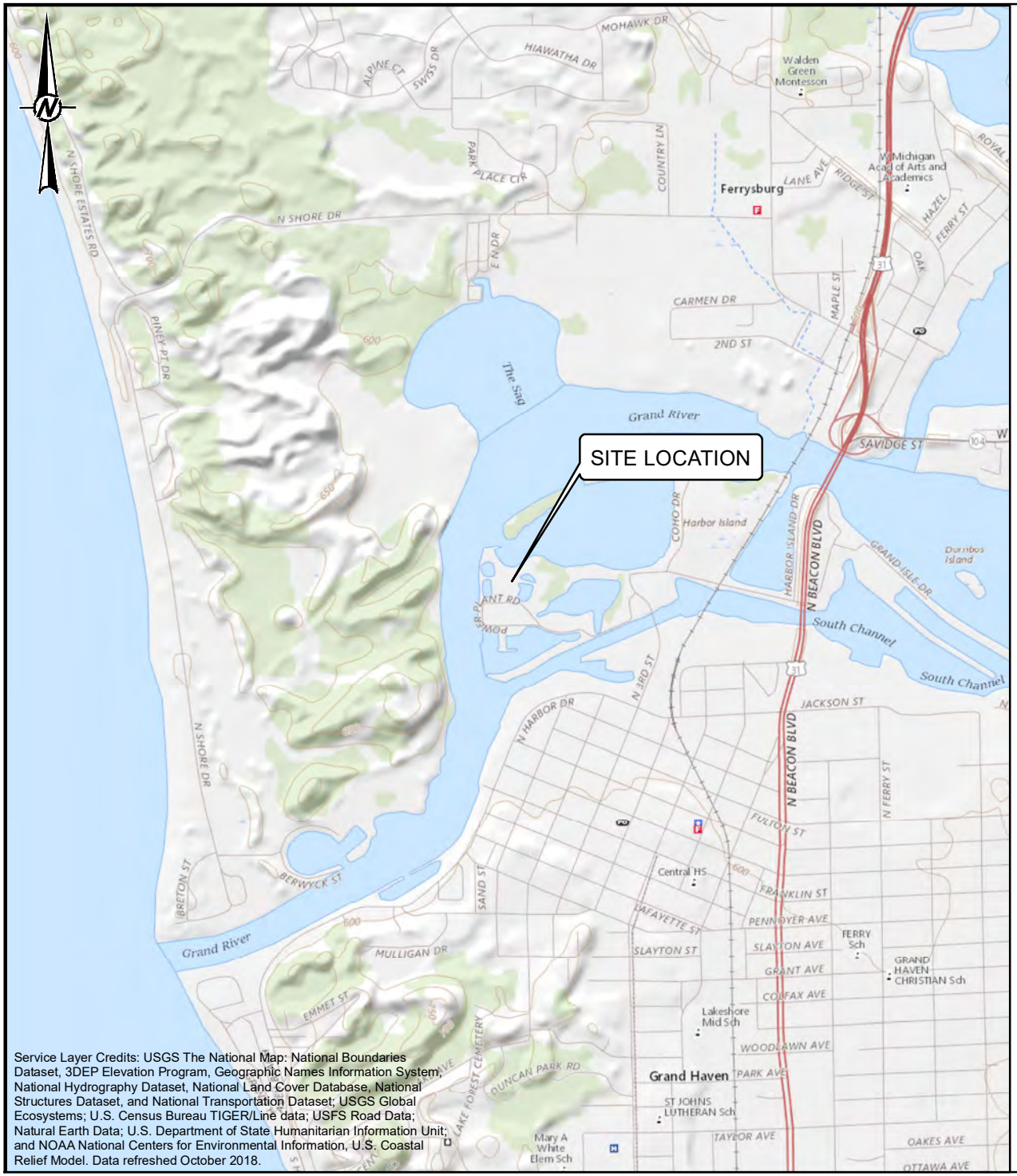
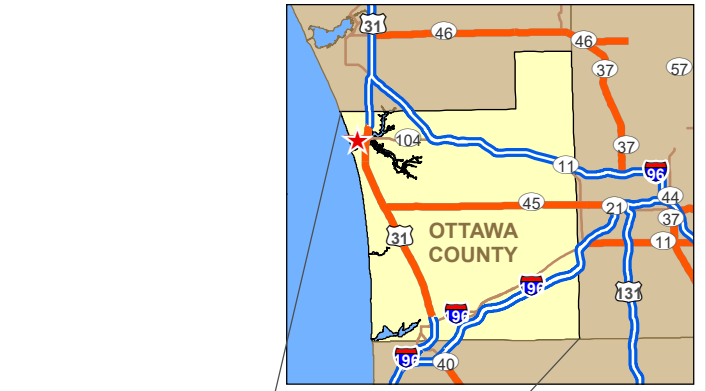


Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System; National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed October 2018.



0 1000 2000

Feet

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

PROJECT
JB SIMS GENERATING STATION
MIXING ZONE DETERMINATION ZONE

TITLE
SITE LOCATION MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-05
PREPARED	DJC
DESIGN	CEP
REVIEW	CEP
APPROVED	DPR

PROJECT No.	CONTROL	Rev.	FIGURE
20141048	20141048A000-GIS.mxd	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A

1 in

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REFERENCE

AERIAL PHOTOGRAPH COURTESY OF GOOGLE EARTH PRO; IMAGE DATE: 2018-09-22.

NOTE(S)

1. HORIZONTAL COORDINATE SYSTEM BASED ON MICHIGAN STATE PLANE SOUTH, INTERNATIONAL FEET. VERTICAL DATUM IS NAVD 1988.

LEGEND

- DETECTION MONITORING WELL
- ASSESSMENT MONITORING WELL
- PIEZOMETER
- STAFF GAUGE
- PROPOSED MIXING ZONE (~1,890 FEET)
- LIMIT OF UNITS 1/2 ASH PLACEMENT AFTER 1981
- UNIT 3 LIMITS OF ASH PLACEMENT
- MULTIUNIT NETWORK BOUNDARY

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-02
DESIGNED	DPR
PREPARED	DJC
REVIEWED	CEP
APPROVED	DPR

PROJECT
JB SIMS GENERATING STATION
MIXING ZONE DETERMINATION REPORT

TITLE
PROPOSED MIXING ZONE

PROJECT NO.	CONTROL	REV.	FIGURE
20141048	20141048B001.dwg	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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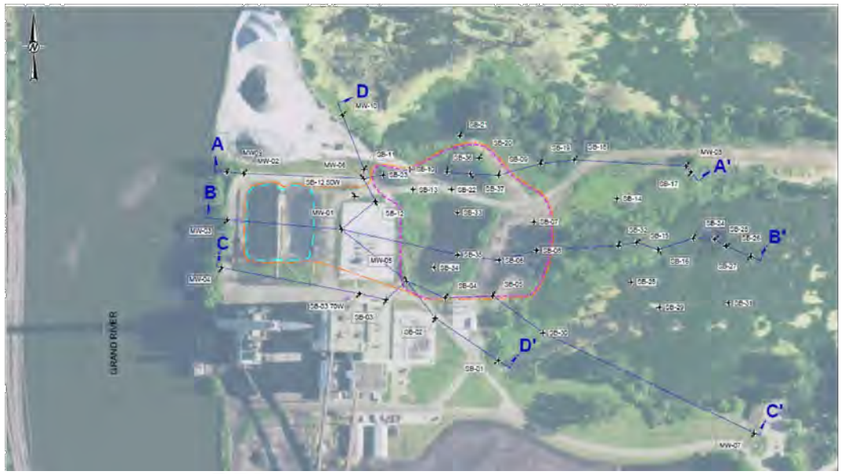
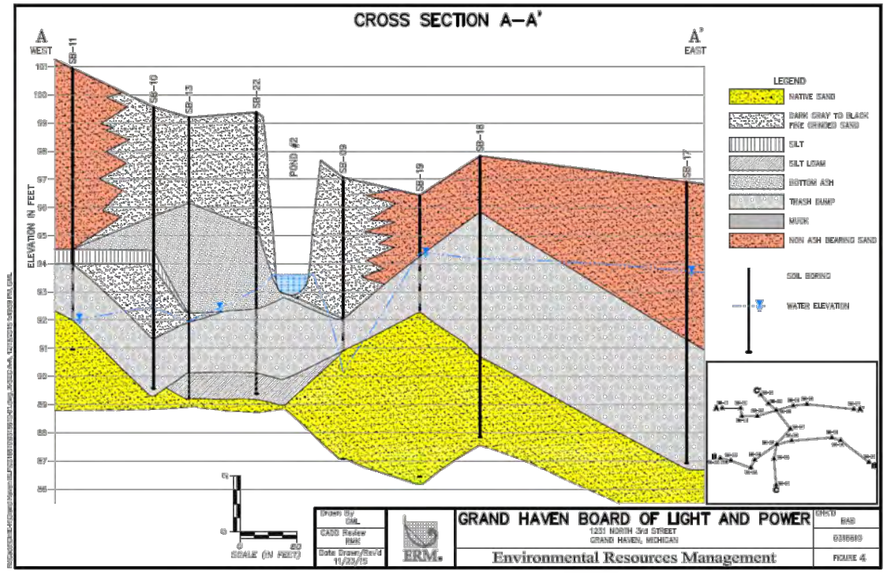
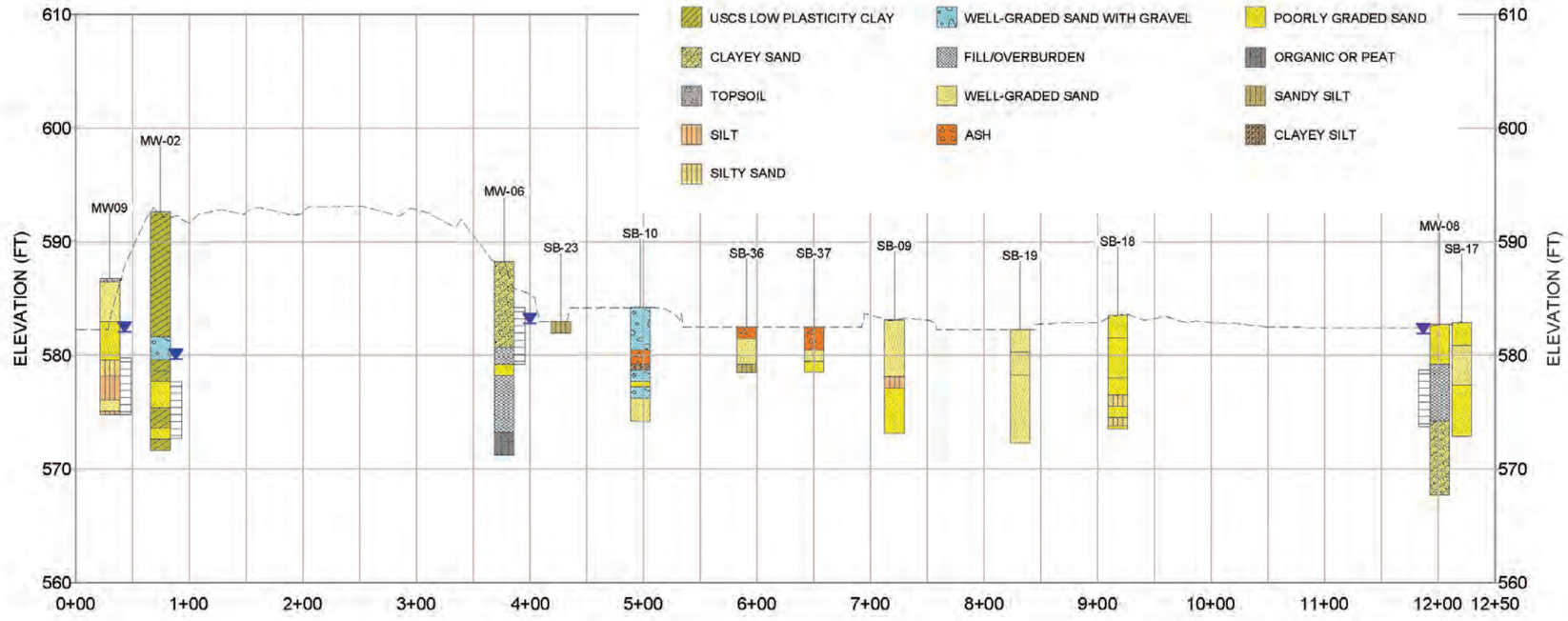
Cross-Section A-A'

JB SIMS GENERATING STATION







A-A'

NOTE: ERM cross-section A-A' is displayed as a supplement to Golder cross-section A-A', given their similar locations across the study area. See ERM inset map for details.

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-05
DESIGNED	CEP
PREPARED	DJC
REVIEWED	CEP
APPROVED	DPR

PROJECT
JB SIMS GENERATING STATION
MIXING ZONE DETERMINATION REPORT

TITLE
CROSS SECTION A-A'

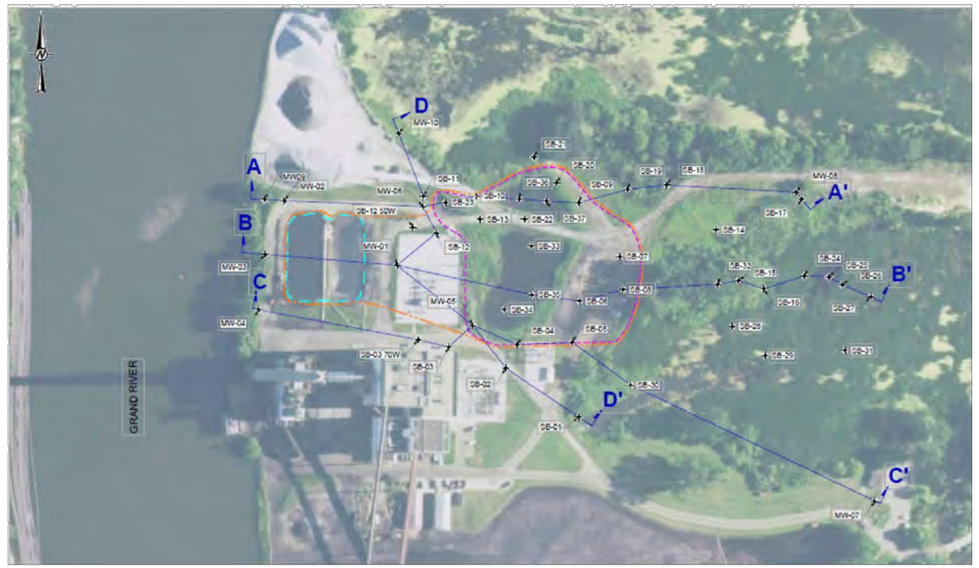
PROJECT NO.	CONTROL	REV.	FIGURE
20141048	20141048B002.dwg	0	3

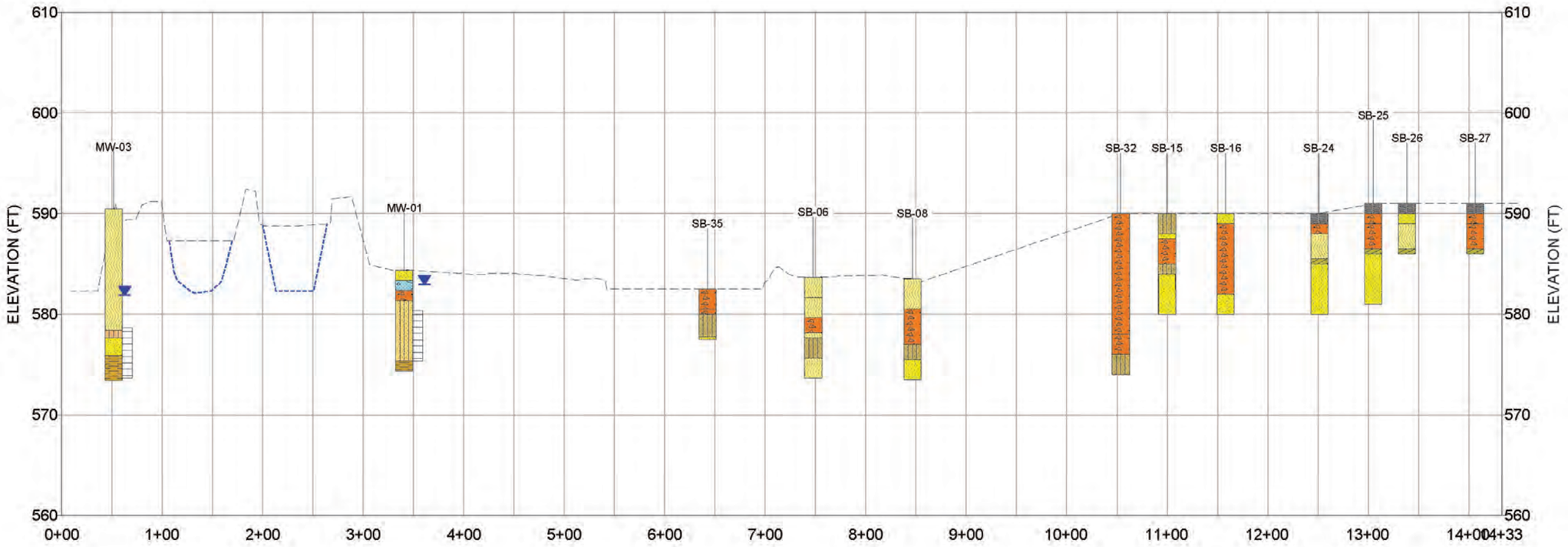
Cross-Section B-B’

JB SIMS GENERATING STATION

LEGEND

- USCS LOW PLASTICITY CLAY
- SILT
- SILTY SAND
- WELL-GRADED SAND WITH GRAVEL
- WELL-GRADED SAND
- ASH
- POORLY GRADED SAND
- SANDY SILT
- LOW PLASTICITY ORGANIC SILT OR CLAY
- ORGANICS/TOPSOIL





B-B'

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-05
DESIGNED	CEP
PREPARED	DJC
REVIEWED	CEP
APPROVED	DPR

PROJECT
JB SIMS GENERATING STATION
MIXING ZONE DETERMINATION REPORT

TITLE
CROSS SECTION B-B'

PROJECT NO.	CONTROL	REV.	FIGURE
20141048	20141048B003.dwg	0	4

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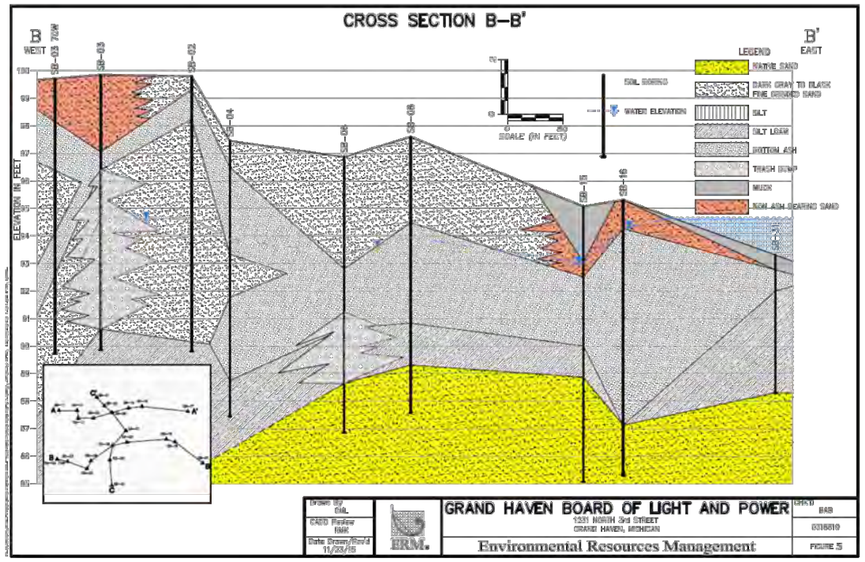
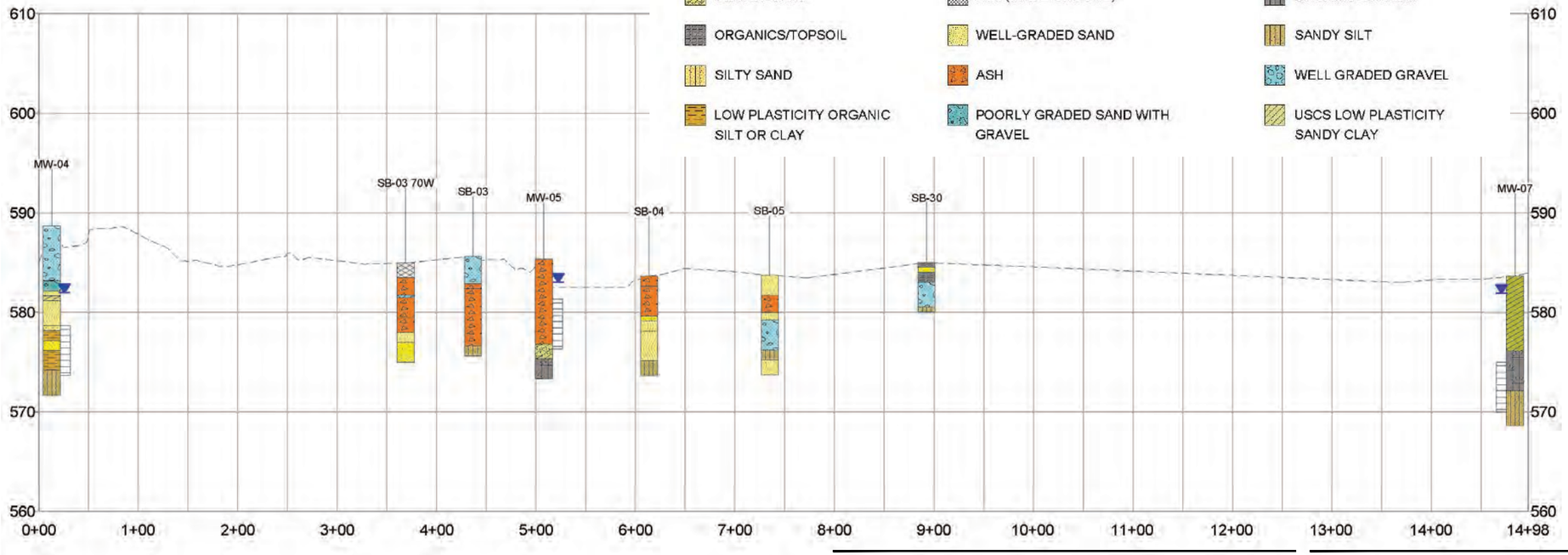
1 in

Cross-Section C-C'

JB SIMS GENERATING STATION





C-C'

NOTE: ERM cross-section B-B' is displayed as a supplement to Golder cross-section C-C', given their similar locations across the study area. See ERM inset map for details.

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-05
DESIGNED	CEP
PREPARED	DJC
REVIEWED	CEP
APPROVED	DPR

PROJECT
JB SIMS GENERATING STATION
MIXING ZONE DETERMINATION REPORT

TITLE
CROSS SECTION C-C'

PROJECT NO.	CONTROL	REV.	FIGURE
20141048	20141048B004.dwg	0	5

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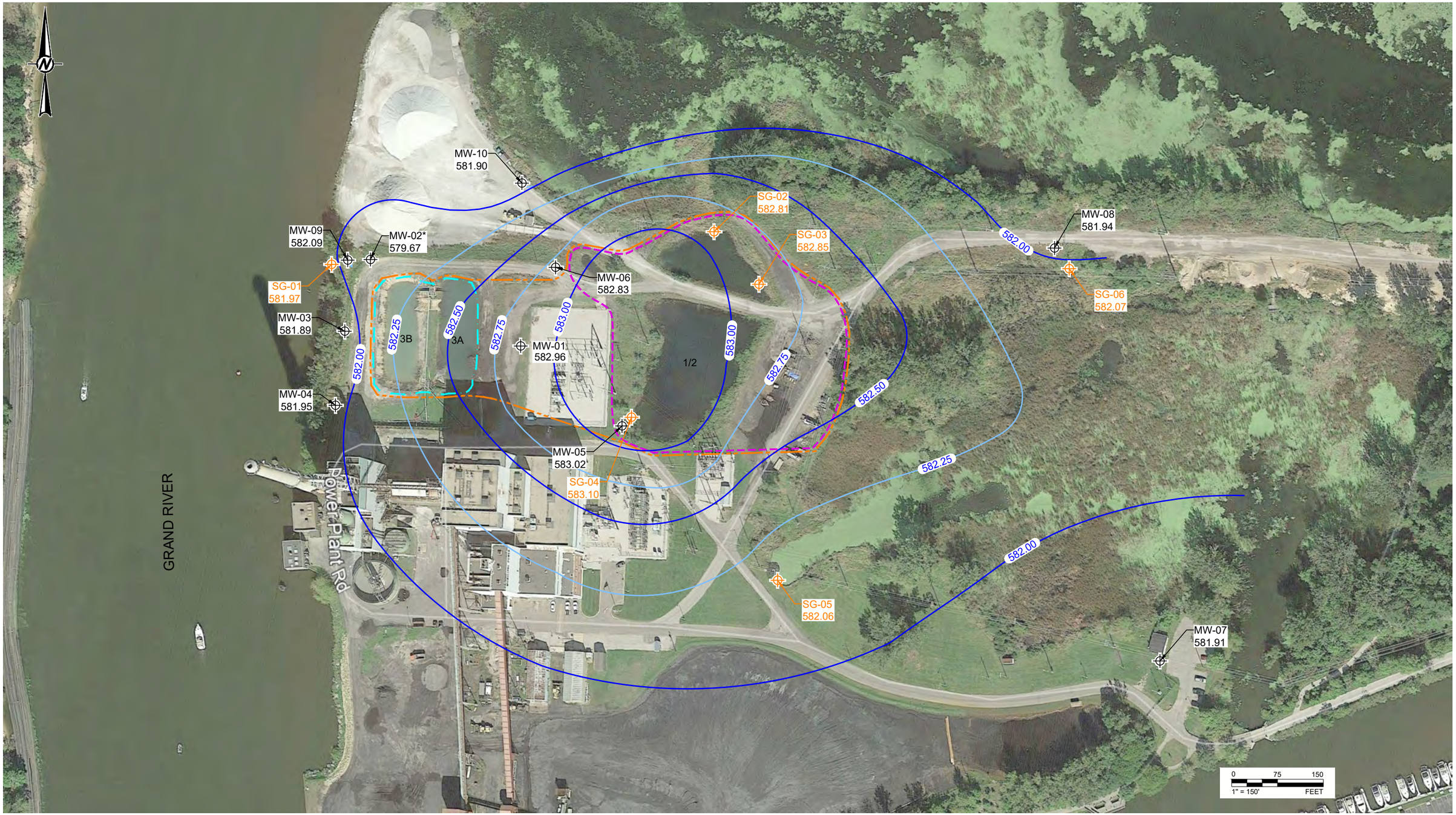

REFERENCE(S)

Service Layer Credits: Source: ESRI, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Date of imagery, 7/14/2016.

NOTE(S)

1. HORIZONTAL COORDINATE SYSTEM BASED ON MICHIGAN STATE PLANE SOUTH, INTERNATIONAL FEET. VERTICAL DATUM IS NAVD 1988.
2. * GROUNDWATER ELEVATION FOR MW-02 WAS NOT USED TO CREATE CONTOURS DUE TO ANOMALOUS ELEVATION DATA.
3. BACKGROUND EVENT FOR MW-05 TO MW-08, THEREFORE MONITORING WELLS MW-01 TO MW-04 WERE NOT GAUGED.
4. MONITORING WELLS MW-09 & MW-10 & STAFF GAUGE SG-01 THROUGH SG-06 WERE INSTALLED PRIOR TO THIS EVENT.

LEGEND

- DETECTION MONITORING WELL
- ASSESSMENT MONITORING WELL
- PIEZOMETER
- STAFF GAUGE
- LIMIT OF UNITS 1/2 ASH PLACEMENT AFTER 1981
- UNIT 3 LIMITS OF ASH PLACEMENT
- MULTIUNIT NETWORK BOUNDARY

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-05
DESIGNED	CEP
PREPARED	DJC
REVIEWED	CEP
APPROVED	DPR

PROJECT
JB SIMS GENERATING STATION
MIXING ZONE DETERMINATION REPORT

TITLE
GROUNDWATER CONTOUR MAP
NOVEMBER 15, 2019

PROJECT NO.	CONTROL	REV.	FIGURE
20141048	20141048B005.dwg	0	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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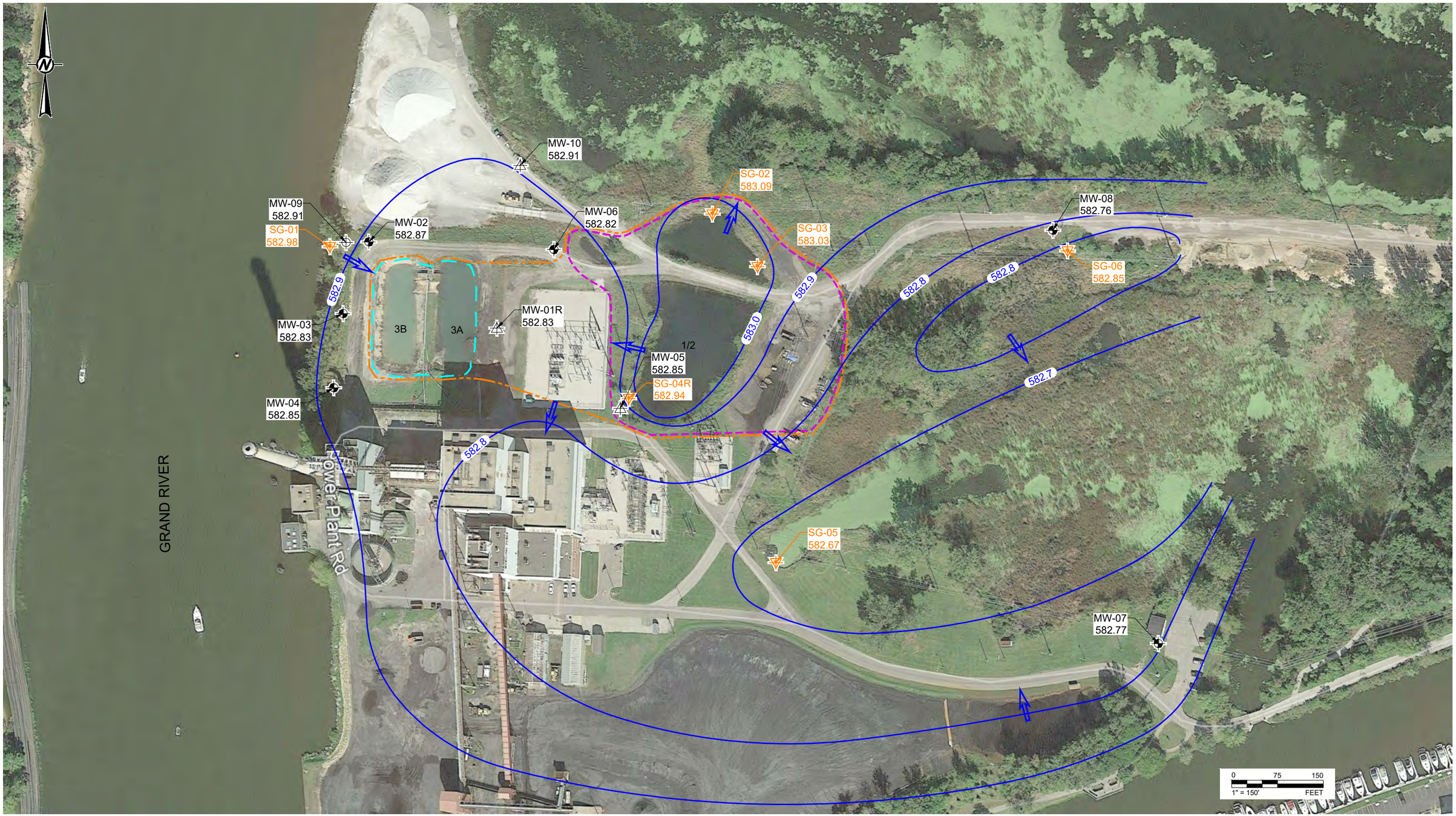


REFERENCE

AERIAL PHOTOGRAPH COURTESY OF GOOGLE EARTH PRO; IMAGE DATE: 2018-09-22.

NOTE(S)

1. HORIZONTAL COORDINATE SYSTEM BASED ON MICHIGAN STATE PLANE SOUTH, INTERNATIONAL FEET. VERTICAL DATUM IS NAVD 1988.

LEGEND

- DETECTION MONITORING WELL
- ASSESSMENT MONITORING WELL
- PIEZOMETER
- STAFF GAUGE
- 582 — GROUNDWATER CONTOURS
- LIMIT OF UNITS 1/2 ASH PLACEMENT AFTER 1981
- UNIT 3 LIMITS OF ASH PLACEMENT
- MULTIUNIT NETWORK BOUNDARY
- GROUNDWATER FLOW DIRECTION

CLIENT
GRAND HAVEN BOARD OF LIGHT AND POWER
GRAND HAVEN, MICHIGAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-05
DESIGNED	CEP
PREPARED	DJC
REVIEWED	CEP
APPROVED	DPR

PROJECT
JB SIMS GENERATING STATION
MIXING ZONE DETERMINATION REPORT

TITLE
GROUNDWATER CONTOUR MAP
JUNE 17, 2020

PROJECT NO.	CONTROL	REV.	FIGURE
20141048	20141048B006.dwg	0	7

TABLE 1.
Summary of Analytical Data for GSI Monitoring Wells
GRAND HAVEN BOARD OF LIGHT AND POWER
Grand Haven, Michigan

Analyte	Screening Criteria				MW-3													
	MI Parts 31/201 GSI Criteria			Average Background Results														
	Generic GSI	FCV	FAV															
				Sample Date:	3/13/2017	4/5/2017	4/24/2017	5/15/2017	6/5/2017	6/26/2017	7/17/2017	8/7/2017	8/27/2018	9/26/2018	10/22/2018	3/27/2019	9/30/2019	3/27/2020	6/17/2020
Appendix III																			
BORON	**7.2**	**7.2**	69	16	5	4.9	5.6	6.4	5.9	4.8	4.9	4.7	4.9	5.3	4.9	**7.7**	3.3	4.9	4.5
CALCIUM	See TDS			200	**660**	**620**	**600**	**620**	**590**	**540**	**590**	**520**	**530**	**560**	**550**	**560**	500	**590**	**590**
CHLORIDE	500	**150**	**640**	15	**570**	**620**	**450**	**480**	**450**	**370**	**400**	**370**	**340**	**340**	**660**	**430**	**360**	**340**	**360**
FLUORIDE (G)	ID	2.65	19.4	0.2	0.74 J	0.97	1.3	1.9	1.7	1.6	1.2	1.2	1.1	0.88	0.84	2.5	0.61	1.4	1.2
IRON	NA	NA	NA	22.39	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	20	8.1	19	11
pH	6.5-9.0	NA	NA	6.65-8.22	7.91	7.14	6.27	6.92	7.07	7.70	7.44	7.61	7.02	7.01	7.19	7.81	7.74	7.03	7.99
SULFATE	See TDS	**370**	**1,200**	79.5	**1,300**	**1,200**	**1,200**	**1,500**	**990**	**580**	**820**	**600**	**450**	**520**	**990**	280	49	**890**	**720**
TDS	**500**	NA	NA	801	**4,000**	**3,600**	**3,900**	**4,100**	**3,600**	**3,000**	**3,100**	**2,700**	**3,000**	**3,100**	**2,900**	**2,800**	**2,900**	**3,200**	**3,400**
Appendix IV																			
ARSENIC	0.01	0.15	0.68	0.0048	0.0024 J	0.0021 J	0.0017 J	0.0020 J	0.0027 J	0.0029 J	0.0025 J	0.0021 J	0.0017	0.0016	0.0013	0.0019	0.0018	0.0018	0.0017
BARIUM (G)	1.159	1.166	6.613	0.5052	0.31 B	0.36 B	0.25	0.21	0.31	0.37	0.41	0.4	0.4	0.4	0.44	0.51	0.51	0.31	0.44
LEAD (G)	0.051	0.051	0.496	0.0029	0.00038 J	0.00045 J B	0.00026 J	0.00079 J	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.000094 J	< 0.00004	0.00019 J	0.00012 J	0.000089 J	<0.002	<0.0005
LITHIUM	0.44	0.44	1.8	0.059	0.079 B	0.064	0.081 B	0.097	0.076	0.066	0.057	0.054	0.064	0.069	0.026	0.025	<0.010	0.076	0.054

River > Groundwater (bank storage)

Above Generic GSI (groundwater surface water interface) or FCV (final chronic value)

Above FAV (final acute value)

Average background concentration above Generic GSI

GOLDER

TABLE 2.
Summary of Analytical Data for GSI Monitoring Wells
GRAND HAVEN BOARD OF LIGHT AND POWER
Grand Haven, Michigan

Analyte	Screening Criteria				MW-4													
	MI Parts 31/201 GSI Criteria			Average Background Results														
	Generic GSI	FCV	FAV															
				Sample Date:	3/13/2017	4/5/2017	4/24/2017	5/15/2017	6/5/2017	6/26/2017	7/17/2017	8/7/2017	8/27/2018	9/26/2018	10/22/2018	3/27/2019	9/30/2019	3/27/2020	6/17/2020
Appendix III																			
BORON	7.2	7.2	69	16	3.2	3.4	3.8	3.6	3.9	3.6	3.7	4	3.6	4.4	4.1	5.8	3.7	3.1	3.2
CALCIUM	See TDS			200	480	470	500	450	450	460	**510**	470	430	490	440	420	440	390	410
CHLORIDE	500	**150**	640	15	**360**	**390**	**350**	**370**	**360**	**360**	**340**	**280**	**260**	**270**	**280**	**310**	**250**	**220**	**210**
FLUORIDE (G)	ID	2.65	19.4	0.2	0.84	1.3	1	1.2	1.4	1.2	1.3	1.3	1.1	1.2	1.3	1	1.2	1.5	1.3
IRON	NA	NA	NA	22.39	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	8.7 J	7.4	10	7.2
pH	6.5-9.0	NA	NA	6.65-8.22	8.34	8.10	6.37	7.20	7.36	7.76	7.51	7.72	7.11	7.13	7.35	7.9	7.69	7.46	7.92
SULFATE	See TDS	**370**	**1200**	79.5	**890**	**940**	**830**	**940**	**880**	**920**	**940**	**740**	**550**	**770**	**600**	**610**	**700**	**680**	**700**
TDS	**500**	NA	NA	801	**2,200**	**2,400**	**2,500**	**2,100**	**2,400**	**3,100**	**2,600**	**2,000**	**2,300**	**2,400**	**2,200**	**1,900**	**2,000**	**1,500**	**1,900**
Appendix IV																			
ARSENIC	0.01	0.15	0.68	0.0048	0.0013 J	0.0013 J	0.0012 J	0.0015 J	0.0019 J	0.0020 J	0.0020 J	0.0018 J	0.0016	0.0012	0.0012	0.0013	0.0013	0.0013	0.0013
BARIUM (G)	1.159	1.166	6.613	0.5052	0.13 B	0.13 B	0.14	0.14	0.16	0.18	0.17	0.19	0.17	0.15	0.16	0.095	0.14	0.1	0.11
LEAD (G)	0.051	0.051	0.496	0.0029	0.00028 J	0.00032 J B	0.00019 J	0.00051 J	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.00014 J	0.00033 J	0.0004	0.00037 J	0.00030 J	<0.002	<0.0005
LITHIUM	0.44	0.44	1.8	0.059	0.053 B	0.047	0.058 B	0.051	0.049	0.051	0.048	0.046	0.056	0.073	0.026	0.036	<0.010	0.056	0.052

River > Groundwater (bank storage)

Above Generic GSI (groundwater surface water interface) or FCV (final chronic value)

Above FAV (final acute value)

Average background concentration above Generic GSI

GOLDER

TABLE 3.
Summary of Analytical Data for GSI Monitoring Wells
GRAND HAVEN BOARD OF LIGHT AND POWER
Grand Haven, Michigan

Analyte	Screening Criteria				MW-9		
	MI Parts 31/201 GSI Criteria			Average Background Results			
	Generic GSI	FCV	FAV				
				Sample Date:	9/30/2019	3/27/2020	6/17/2020
Appendix III							
BORON	7.2	7.2	69	16	6.9	5	5.1
CALCIUM	See TDS			200	280	250	250
CHLORIDE	500	150	640	15	18	11	11
FLUORIDE (G)	ID	2.65	19.4	0.2	2.3	2.4	2.5
IRON	NA	NA	NA	22.39	20	29	17
pH	6.5-9.0	NA	NA	6.65-8.22	7.75	7.41	7.91
SULFATE	See TDS	370	1,200	79.5	9.6	94	100
TDS	**500**	NA	NA	801	**1100**	**890**	**1500**
Appendix IV							
ARSENIC	0.01	0.15	0.68	0.0048	0.0035	0.002	0.0022
BARIUM (G)	**1.159**	**1.166**	6.613	0.5052	**1.80**	1.1	**1.40**
LEAD (G)	0.051	0.051	0.496	0.0029	0.002	<0.002	0.00083 J
LITHIUM	0.44	0.44	1.8	0.059	0.16	0.28	0.049

River > Groundwater (bank storage)

Above Generic GSI (groundwater surface water interface) or FCV (final chronic value)

Above FAV (final acute value)

Average background concentration above Generic GSI

TABLE 4.
Summary of Analytical Data for GSI Monitoring Wells
GRAND HAVEN BOARD OF LIGHT AND POWER
Grand Haven, Michigan

Analyte	Screening Criteria				MW-10		
	MI Parts 31/201 GSI Criteria			Average Background Results			
	Generic GSI	FCV	FAV				
				Sample Date:	9/30/2019	3/27/2020	6/17/2020
Appendix III							
BORON	**7.2**	**7.2**	69	16	**46**	**35**	**39**
CALCIUM	See TDS			200	150	130	130
CHLORIDE	500	**150**	640	15	**550**	94	**430**
FLUORIDE (G)	ID	**2.65**	19.4	0.2	**10**	**11**	**10**
IRON	NA	NA	NA	22.39	8.4	11	9.2
pH	6.5-9.0	NA	NA	6.65-8.22	7.66	7.92	8.4
SULFATE	See TDS	370	1,200	79.5	<3.0	5.8	2.9 J
TDS	**500**	NA	NA	801	**1700**	**1500**	**1600**
Appendix IV							
ARSENIC	0.01	0.15	0.68	0.0048	0.00097 J	0.0014	0.0011
BARIUM (G)	**1.159**	**1.166**	6.613	0.5052	**1.2**	1.1	**1.2**
LEAD (G)	0.051	0.051	0.496	0.0029	0.0039	0.045	0.0011 J
LITHIUM	**0.44**	**0.44**	1.8	0.059	**1.2**	**1.2**	0.22

River > Groundwater (bank storage)

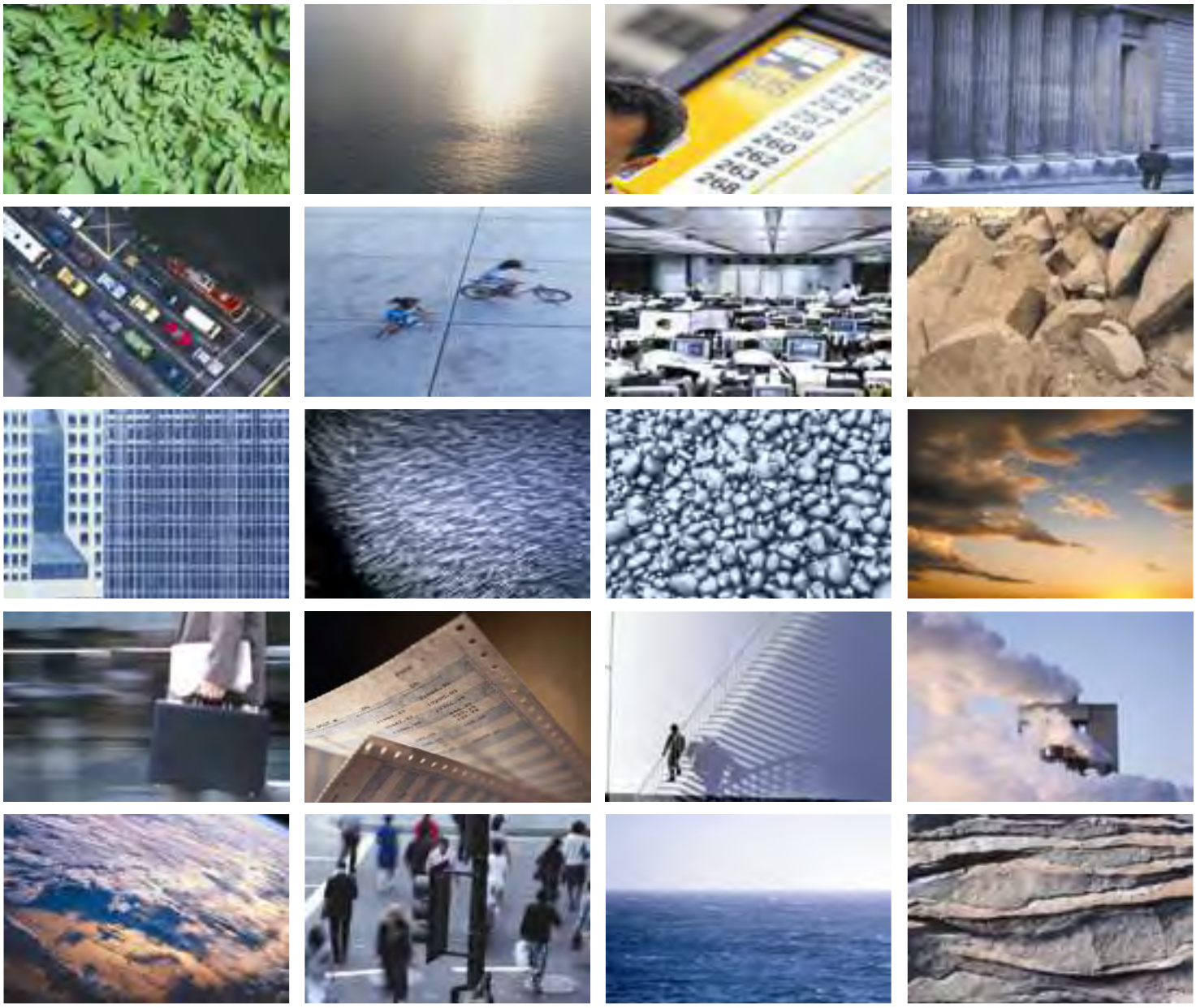
Above Generic GSI (groundwater surface water interface) or FCV (final chronic value)

Above FAV (final acute value)

Average background concentration above Generic GSI

Attachment A

Groundwater Monitoring System Certification



Groundwater Monitoring System Certification

Grand Haven Board of Light and Power
JB Sims Generation Station
1231 North 3rd Street
Grand Haven, Michigan

October 2017

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Certification

In accordance with the requirements of 40 CFR §257.91(f), I hereby certify that the groundwater monitoring system for the active unit at the Grand Haven Board of Light and Power - JB Sims Generating Station has been designed and constructed to meet the requirements specified in Section 257.91 of the Federal Coal Combustion Residuals (CCR) Rule. I certify that the monitoring system, consisting of one upgradient and three downgradient monitoring wells is adequate for the active unit because the wells are screened in the uppermost aquifer system and the downgradient wells are located directly downgradient of the CCR unit and adjacent to the Grand River.

I further certify that I am a duly Licensed Professional Engineer under the laws of the State of Michigan.

Th P. O'Cll

Thomas P. O'Connell, P.E.

PE#: 6201040085

My license renewal date is 31 October 2019

Th P. O'Cll

1.0 INTRODUCTION

1.1 INTRODUCTION

On behalf of the Grand Haven Board of Light and Power (GHBLP), Environmental Resour**ces M**anagement Michigan, Inc. (ERM) prepared this report to certify that the groundwater monitoring system at the JB Sims Generation Station complies with the federal Coal Combustion Residuals (CCR) Rule (40 CFR Part 257), which went into effect on October 19, 2015.

Section 257.91 of the CCR Rule outlines the requirements of the groundwater monitoring system, including performance standards. This Certification is intended to support the certification that the groundwater monitoring system installed at the Site is in compliance with the Rule.

1.2 SYSTEM CERTIFICATION REQUIREMENT SUMMARY

Table 1 below provides details of the system certification requirements outlined in §257.91 of the CCR Rule and this Site's compliance with the rule.

Table 1. CCR Rule Requirements and Compliance

CCR Rule Requirements (§257.91)	**Compliance with CCR Rule**
(a) **Performance Standard:** The owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer" that: (1)2 Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where: a.2 Hydrogeologic conditions do not allow the owner or operator of the CCR Unit to determine what wells are hydraulically upgradient; or b.2 Sampling at other wells will provide an indication	**Yes.** The direction of groundwater flow has been determined at the site: the groundwater monitoring system includes the minimum number of wells at appropriate locations and depths to yield groundwater samples necessary

of background groundwater quality that is representative or more representative than that provided by the upgradient wells; and (2)2 Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contamination must be monitored.	to meet performance standards (a)(1) and (a)(2) See Section 3.0
(b) **Well Spacing and Site Specific Information:** The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that must include thorough characterization of: (1)2 Aquifer thickness, groundwater flow rate, seasonal and temporal fluctuations in groundwater flow; and (2)2 Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thickness, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.	**Yes.** The monitoring system was designated based on results of technical, site-specific data, including (b)(1) and (b)(2). See Sections 2.0 and 3.0
(c) **Number of Monitoring Wells:** The groundwater monitoring system must include the minimum number of monitoring wells necessary to meet the performance standards specified in paragraph (a) of this section, based on the site-specific information specified in paragraph (b) of this section. The groundwater monitoring system must contain: (1)2 A minimum of one upgradient and three downgradient monitoring wells; and (2)2 Additional monitoring wells as necessary to accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.	**Yes.** One upgradient and three downgradient wells that meet the performance standards are being monitored in compliance with the CCR Rule. See Section 3.0
(d) Multiunit Groundwater Systems: The owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.	**Not Applicable.** This Site does not contain multiple active CCR units; therefore, the system does not need to meet the requirements of this paragraph.

(e) **Monitoring Well Construction**: Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space (i.e. the space between the borehole and well casing) above the sampling depth must be sealed to prevent contaminating of samples and the groundwater. (1)2 The owner or operator of the CCR unit must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers, and other measurements, sampling, and analytical devices. The qualified professional engineer must be given access to this documentation when completing the groundwater monitoring system certification required under paragraph (f) of this section. ( )2 The monitoring wells, piezometers, and other measurements, sampling, and analytical devices must be operated and maintained so that they perform to the design specifications throughout the life of the monitoring program.	**Yes.** Well design meets requirements of (e). See Section 3.0 Groundwater monitoring system will be operated and maintained per (e)(2).
(f) Certification: The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section, the certification must document the basis supporting this determination.	**Yes.** System designed and constructed to meet the requirements of Section 257.91. Technical information to support certification and number of wells, per (c)(1). See Section 4.0 and Certifications page.

2.0 SITE SETTING

2.1 SITE SETTING

The J.B. Sims Generating Station ("Site") is a coal fired, steam-generating plant with a net capacity of approximately 70.5 megawatts. The Site is located on the southwestern portion of Harbor Island at 1231 North 3rd Street in Grand Haven, Michigan (**Figure 1**). The Grand River and South Channel of the Grand River surround Harbor Island and flow in a westerly direction to Lake Michigan which lies about one mile west of the Site.

The Site has two CCR surface impoundments (ash ponds) that are used to contain the bottom ash captured by the facility's precipitator. The impoundments are located in the northwest corner of the Site, are similar in size and are situated adjacent to each other with a common embankment between them (see **Figure 2**). According to the *Grand Haven BLP – Ash Impoundment Evaluation* (Soils & Structures, July 2016), the ponds are 175 to 190 feet long, 71 to 80 feet wide and 4 to 6 feet deep. Based on Google Earth Pro (imagery date 4/14/2016), the western edge of the west pond is about 75 feet from the banks of the Grand River.

2.2 SITE GEOLOGY

Based on the *Quaternary Geology of Southern Michigan* (Ferrand and Bell, 1982), the Site is located in an area of glacial sand and gravel, which consists of fine to medium sand with occasional beds of small gravel. The sands were deposited as former beach and near-offshore littoral deposits from the glacial Great Lakes. The *Hydrogeologic Atlas of Michigan* (Western Michigan University, 1981) indicates that there is 100 to 200 feeet of glacial drift in the area which is underlain by Marshall Sandstone.

Soil borings conducted in the northeast portion of the Site in 2015 showed fill material including a former trash dump and coal ash extending to a depth of up to 10 feet below ground surface (bgs). Two native depositional layers were identified underlying the trash dump: a silt loam and a fine grained native sand deposit.

Borings completed for the installation of the groundwater monitoring system wells (Attachment A) show that the dominant geology observed at

the Site in the upper 20 feet consists primarily unconsolidated fine sand with intervals of silt and blends of sand and silt. Silt or clay was encountered at the bottom of each boring and represent the confining unit beneath the ash ponds and the uppermost aquifer.

Sands in the uppermost aquifer are described as poorly-graded and well-graded fine sand. Based on the U.S. Environmental Protection Agency (USEPA) document SW-846 – *Test Methods for Evaluating Solid Waste*, Volume 1C, Table C, poorly-graded fine sand has an estimated hydraulic conductivity of 27 feet per day and well-graded fine sand has a hydraulic conductivity of 53 feet per day.

Static water levels were measured from January through August, 2017 to determine the groundwater gradient and flow direction. The groundwater flow direction across the monitoring area was shown to consistently be in a westerly direction toward the Grand River. The flow gradient ranged from 0.0004 to 0.008.

The groundwater flow rate (seepage velocity) in the vicinity of the ash ponds was calculated using the equation:

$V = Ki/n$
Where:
V = velocity
K = hydraulic conductivity
I = hydraulic gradient
N = porosity

Assuming an effective porosity of 30% (Driscoll, 1986), a hydraulic conductivity of 27 to 53 ft/day and hydraulic gradients from 0.0004 to 0.008 ft/day, the groundwater fow rate ranges from 0.036 to 1.41 ft/day.

3.0 MONITORING SYSTEM

3.1 MONITORING SYSTEM

Thee monitoring well system around the CCR unit consists of one upgradient well (MW-01) and three downgradient wells (MW-02, MW-03, and MW-04). The well locations are shown in **Figure 2**. The upgradient monitoring well is hydraulically upgradient of the CCR unit and accurately represents background groundwater quality. The downgradient monitoring wells are located hydraulically downgradient of the ash ponds. The downgradient monitoring wells are spaced approximately 100 feet apart. **Figure 3** depicts the observed groundwater flow direction based on measurements collected in August 2017.

The number, spacing, and hydraulic positions of the monitoring wells comply with requirements outlined in §257.91 (a)-(c) of the CCR Rule.

3.2 MONITORING WELL CONSTRUCTION AND PERFORMANCE

Based on our understanding of the Site geology, all of the monitoring wells at the Site are screened within the uppermost aquifer. Additionally, they were constructed in a manner which complies with CCR Rule §257.91 (e). All of the monitoring wells on the Site were developed to improve clarity of the water and reduce suspended solids prior to initial baseline sampling. Supporting documentation is provided in Section 7.0 of the 10 March 2017 *Sampling and Analysis Plan*. A summary of monitoring well construction details and geospatial information is provided in Table 2 below.

Table 2 *CCR Monitoring Well Details*

Well ID	Northing (UTM)	Easting (UTM)	Ground Elevation	Top of Casing elevation	Length of Well Stick-up	Measured depth to bottom from TOC	Screened interval
MW-01	176201.037	3847934.632	96.08	99.35	3.27	12.32	4 - 9
MW-02	176247.026	3847865.054	104.49	107.75	3.26	23.37	15 - 20
MW-03	176214.1	3847846.674	102.17	105.20	3.03	20.34	12 - 17
MW-04	176182.574	3847848.69	100.60	103.59	2.99	18.00	10 - 15

Notes

Elevation data measured from a referenced benchmark set at 100.00 feet

Benchmark set at Fire hydrant located just south of CCR ponds (ID # E150706); bolt on south side of hydrant.

Geospatial data is referenced to the Michigan South State Plane coordinate system.

Wells installed via hollow-stem-augers, constructed using 2" diameter PVC with 5' section of 0.10-slot PVC screen.

Wells installed on 1/18/2017.

4.0 SYSTEM CERTIFICATION

The monitoring well network is adequate and conforms to the system certification requirements outlined in §257.91 of the CCR Rule. A professionally licensed engineer has certified this network (see Certification page).

5.0 REFERENCES

Driscoll, F.G., Ph.D. Groundwater and Wells. Johnson Filtration Systems Inc., St. Paul, Minnesota. © 1986.

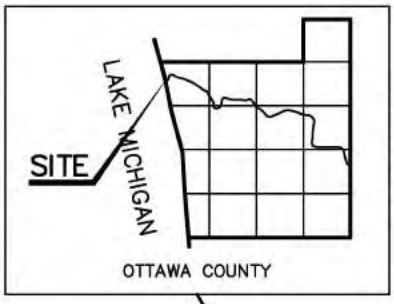
Ferrand, W.R., and Bell, D.L., "Quaternary Geology of Sourthern Michigan". Michigan Department of Natural Resources. Geological Publication QG-01. © 1982.

Soils & Structures. "Grand Haven BLP – Ash Impoundment Evaluation". Soils & Structures, July 2016.

United States Environmental Protection Agency. "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods". EPA Publication SW-846, Third Edition, Final Updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008) and V (2015).

Western Michigan University, Department of Geology. "Hydrogeologic Atlas of Michigan, Volume 1". The Deparment of Geology, Kalamazoo, Michigan. © 1981.

Figures



SECTION 20
T.8N. – R.16W.
CITY OF GRAND HAVEN
OTTAWA COUNTY
MICHIGAN

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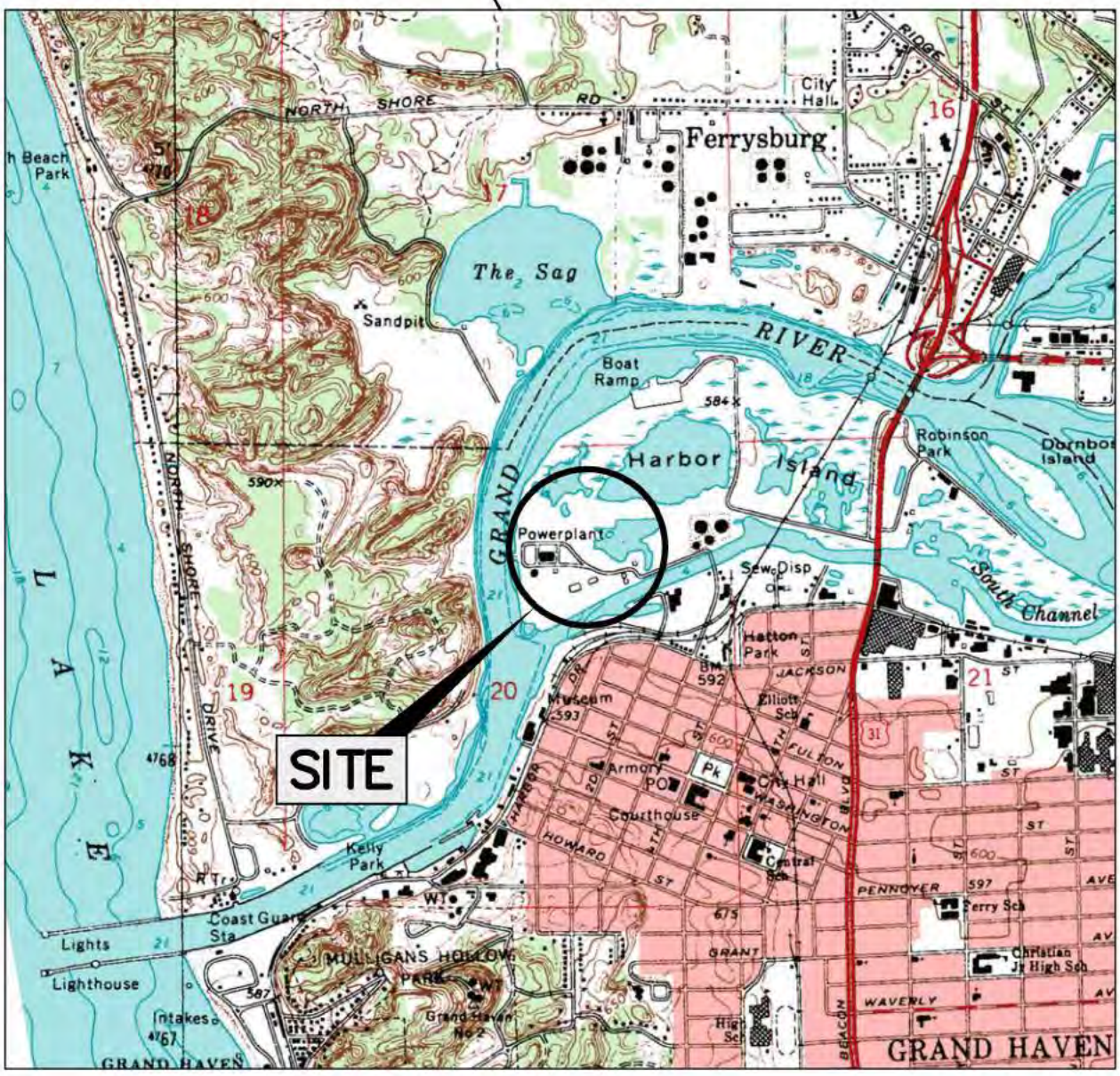
SCALE (IN FEET)



SITE LOCATION MAP

ADAPTED FROM USGS
GRAND HAVEN/1980

REVISIONS ARE TO BE MADE ON THE CADD FILE ONLY

ERM	GRAND HAVEN BOARD OF LIGHT AND POWER 1231 NORTH 3rd STREET GRAND HAVEN, MICHIGAN	CADD Review RMK CHK'D BAB 0318810
Drawn By GML 12/16/15	Environmental Resources Management	FIGURE 1

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MONITORING WELL LOCATION MAP

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SCALE (IN FEET)

Drawn By GML	ERM®	GRAND HAVEN BOARD OF LIGHT & POWER	CHK'D TMB
CADD Review FGB		GRAND HAVEN, MICHIGAN	0432042
Date Drawn/Rev'd 10/26/17		Environmental Resources Management	FIGURE 2

Q:\Team\DMM\CintE-H\Grand Haven BLP\0432042\0432042-01.dwg, MW LOCATION MAP, 10/26/2017 9:16:39 AM, GML

Source: Google Earth

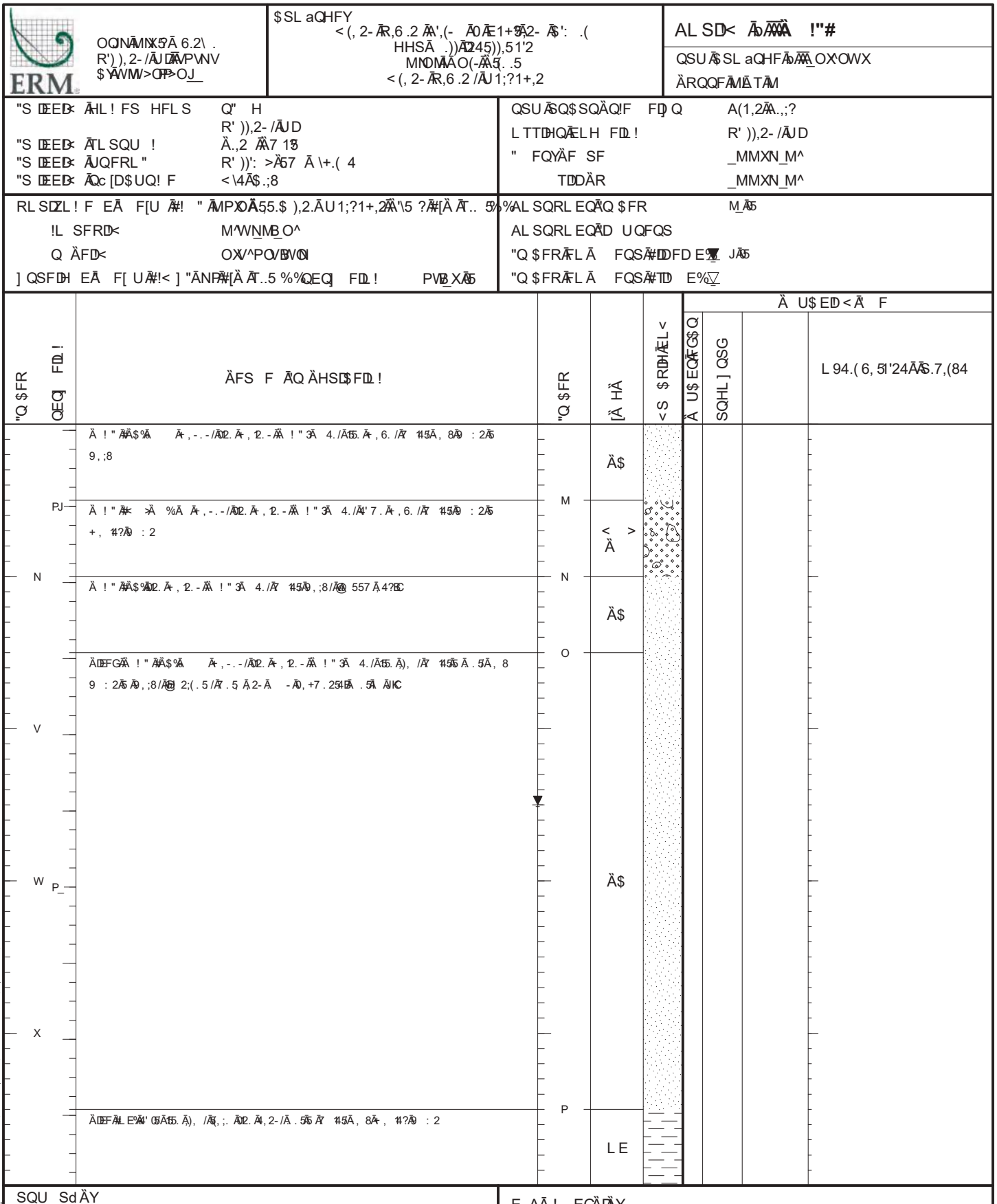
Figure 3 – August 2017 Groundwater Contour Map

Grand Haven Board of Light and Power – JB Sims Generating Station
1231 N 3rd Street Grand Haven, Michigan

Environmental Resources Management Michigan, Inc.
3352 128th Avenue
Holland, Michigan

ERM

Attachment A
Soil Boring and Well
Construction Logs



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RL SDZL! F EĀ F[U Ā#! " ĀMPXOĀ55.$),2.ĀU 1;?1+,2ĀA'\5 ?Ā#[Ā ĀT.. 5%%		AL SQRL EQĀQ $FR	NMĀ5
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Q ĀFD<	OX/^XWB_JV	"Q $FRĀFL Ā FQSĀ#ĐDFD E%	MJĀ5
] QSFDH EĀ F[UĀ#!<] "ĀNPĀ#[Ā ĀT..5 %%QEQ] FĐ!	M_VBVPĀ5	"Q $FRĀFL Ā FQSĀ#TD E%	

"Q $FR	QEQ FĐ!	ĀFS F ĀQ ĀHSD$FĐ!	"Q $FR	[Ā HĀ	< S $RDHĀEL<	Ā U$ EQĀG$Q	SQHL] QSG		L 94.(6, 5l'24ĀĀS.7,(84
		ĀĐEFGĀHE GĀHEĀ7 .-1 7 Ā450ĀA' 7 . Ā415Ā(, ;. Ā02. Ā+ , 6 . /Ā(, ;. Ā02. Ā4, 2- 3Ā7 1ʹ45Ā7 5. -/ 9 : 2Ā2- Ā+ ,		HE					
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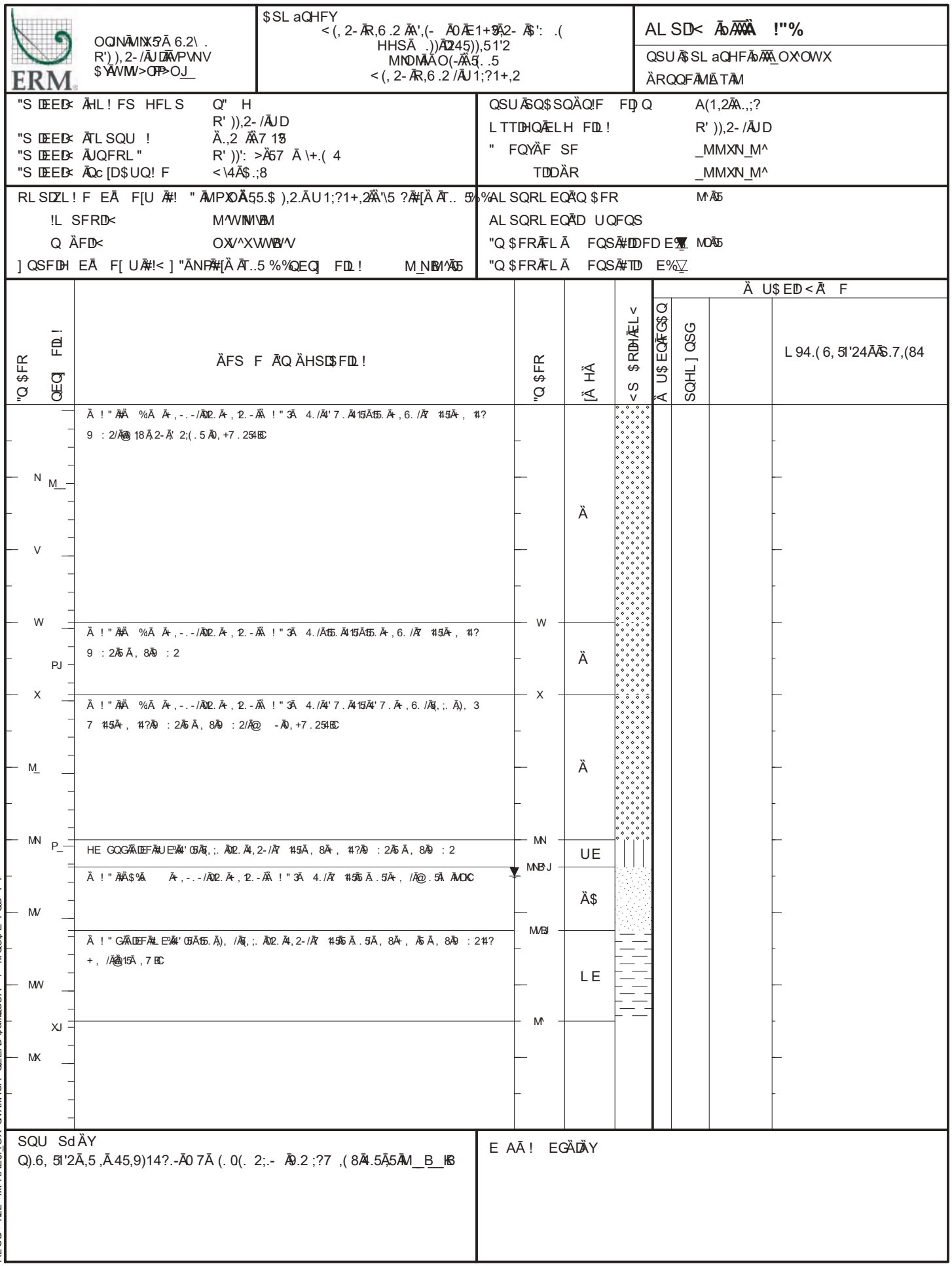

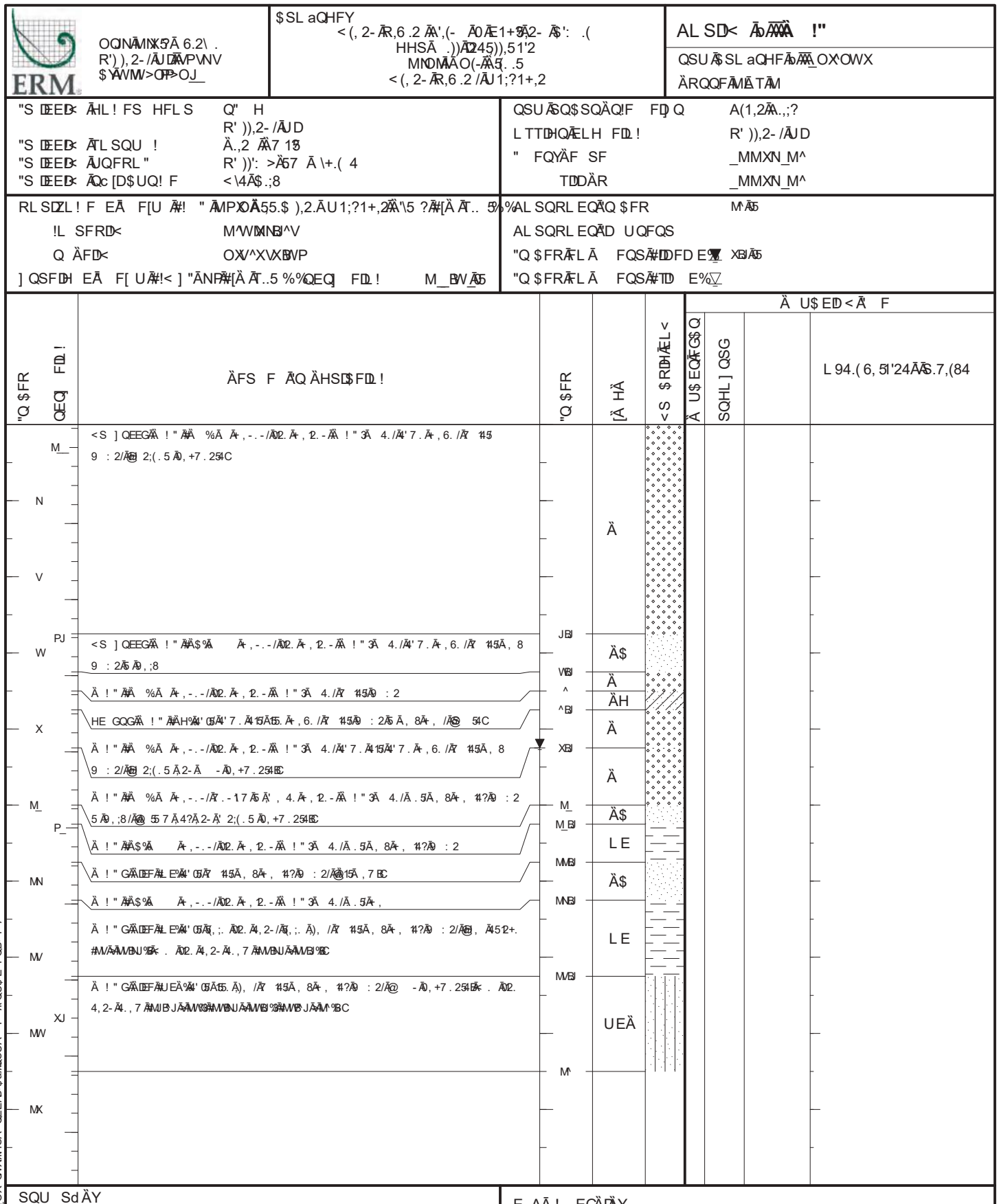
"Q $FR
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ZĀ0 [167716T

+: YV*Q Z
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+Ā9 "%Ā4Ā3D%%2Ā3
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8 .D4#ĀXDH"4 EĀ , !,CD4

N: +P=8 ĀĀĀĀĀ !"#
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ĀXVVQĀ0Ā ` Ā0

>+ P;;P =8 Ā: Q+< Q: +	V>< X2%%DĀ#P	V+] Ā+V +VĀV=Q<QP V	N.,D4ĀN"D !
>+ P;;P =8 Ā : +V] <	Ā"D4ĀĀI ,3	: ` ` PV Ā: <QP	X2%%DĀ#P
>+ P;;P =8 ĀjV QX: >	X2%%2ĀĀ3"I Ā<$C".-	>< QVZĀQ<+Q	0_0^_5' 0a
>+ P;;P =8 Ā/b WP]V Q	8 $-Ā " J	` P=PĀX	0_0^_5' 0a

8 V: 8 +< XPĀ : : +> P=< QVĀ	9 V;;Ā : =ĀQ+W*QP			9 V;; >V V;:] V=Q
?=<>Ā07^6ĀĀ3D3(%D4]Ā !,CD4ĀĀ2$3Ā?WĀĀ "" 3@@	+,-".	Ā ." "4		
: +QXP=8 0a[5 0 / 6a	] D3'.,DZ >,D "3'.ĀP>@Z 2$Ā%4CZ	Sche le 40 PVC 2-inch Threaded	Sche le 40 PVC, 0 010-slot 2-inch Threaded	] "3 2#Z Overp m ping >$.D3,24Z 0.5 ho r s 8 D%/Ā $.C"#Z30
V<ĀQP=8 6^ a 76 / [6 5				
V%"H3D24_Q2AĀ2FĀD -,4CĀV%7H/ ^ĀF3_Ā7/6TĀ3	9 "%%"ĀI ,3ĀZ No permi re ire			

>V QX	V;:V <QP	ĀQ+< Q<Ā+V Ā +P QP	>V QX	WĀĀ	8 +< XPĀ ;; 8
		Ā<=>Ā?Ā @ĀĀ2.%ĀCĀD#"# ĀĀF,4"ĀC.D,4"# ĀĀ<=> GĀ%22-"ĀĀ%3ĀĀC.DH"%E I 2,-3EĀ#D.JĀK.2L 4Ā32ĀK%D		Ā	
	7T	Ā<=>Ā?89 1Ā9 @LĀ"%Ā%Ā#"#EĀF,4"ĀC.D,4"# ĀĀ<=> GĀ%22-"ĀE2I " C.DH"%ĀE 2,-3ĀEK.2L 4Ā32ĀC.DB,-!ĀK.2L 4	0	89 1Ā9	
5		Ā<=>Ā?Ā @FĀ"ĀC.D,4"#ĀĀ<=>GĀ%22-"ĀĀ 2,-3ĀEK%D ĀĀNI2332IĀ D-!/ O	5	Ā	
		ĀP,Q RĀĀ<=>Ā?Ā @ĀĀ2.%ĀCĀD#"# ĀĀF,4"ĀC.D,4"#ĀĀ<=>GĀ%22-"ĀĀ%3Ā%" %DĀĀE2,-3Ā2Ā "3EĀ#D.JĀK.2L 4Ā32ĀK%D ĀĀ2 4 ." 3'EĀ "3D%DĀ4#Ā.22# F.DC "4 3-/Ā9 "3ĀSĀTLO	6		
[	7			Ā	
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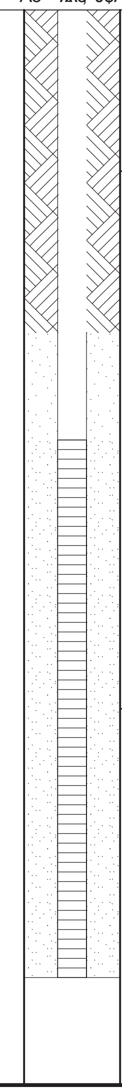
		ĀP,Q Ā?: ;@Ā 2FĀEĀ%3Ā%"Ā%DĀĀ3D "ĀF,4"Ā-D4#ĀE "3Ā32Ā 2,-3EĀ#D.J C.DB-!ĀK.2L 4	7	: ;	

9 V;;Ā : =ĀQ+W*QP



+V] <+c ĀZ
V%"H3D24Ā#D3DĀ-3DK%,-!#ĀF2IĀ ." F." 4 "# ĀK"4 !I DJĀ"3ĀD3Ā0' / U

9 V;;Ā P=ĀQ<;;< QP =Ā : QVĀZ

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66T5Ā05^3 Ā<H"4$"
X2%%4D#Ē FĀ 7&5&
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+: YV*Q Z
8 .D4#ĀXDH'4 ĀN2D.#Ā2FĀ,C! 3ĀD4#Ā 2L".
+Ā9 "%Ā4Ā3D%%2Ā3
0560Ā-Ā6.#ĀĀ3" "3
8 .D4#ĀXDH'4 ĒĀ , !,CD4

N: +P=8 ĀĀĀĀĀ !"$

V+] Ā +: YVQ ĀĀĀĀ6^ a6[^

ĀXVVQĀ0Ā ` Ā0

>+ P;;P =8 Ā: Q+< Q: +	V>< X2%%DĀ#P	V+] Ā+V +V ĀV=Q<QP V	N.,D4ĀN"D !
>+ P;;P =8 Ā : +V] <	Ā"D4ĀĀI ,3	: ` ` PV Ā: <QP:	X2%%DĀ#P
>+ P;;P =8 ĀV QX: >	X2%%2ĀĀ3'I Ā<$C".-	>< QVZĀQ<+Q	0_0^_5' 0a
>+ P;;P =8 Ā/b WP]V Q	8 $-Ā " J	` P=PĀX	0_0^_5' 0a

8 V: 8 + < XPĀ : : +> P=< QVĀ	9 V;;Ā : =Ā Q+ W*QP:			9 V;; >V V;:] V=Q
?=<>Ā07^6ĀĀ3D3(%D4]Ā !,CD4ĀĀ2$3Ā?WĀĀ "" 3@@	+,-".	Ā ." "4		
: +QXP=8 — 0a[5 a / 5[	] D3'.,DĀZ >,D "3'.ĀP>@Z 2$Ā%4CZ	Schedule 40 PVC 2-inch Threaded	Schedule 40 PVC, 0.010-slot 2-inch Threaded	] "3 2#Z Overpumping >$.D3,24Z 0.5 hours 8 D%/Ā $.C"#Z30
V<ĀQP=8 — 6^ a ^[T/ T				
V%"H3D24_Q2AĀ2FĀD -,4CĀV%"DH// 7 Ā3_Ā0'a /aTĀ3	9 "%%"ĀI ,3ĀZ No permit required			

>V QX	V;:V <QP:	ĀQ+< Q<Ā>V Ā +P QP:	>V QX	WĀĀ	8 +< XPĀ :: 8	9 V;;Ā : =Ā Q+ W*QP:
		ĀP,Q RĀ; <RĀ?*;@Ā "# ,$I Ā3FĒĀ 2I "Ā-,%ĒĀ3D "ĀF,4"ĀC.DH"%ĀĒD " F,4"Ā-D4#ĀĀ 2,-3ĒĀ 23%"#ĀK.2L4ĀD4#ĀC.DB		;		D-,4CĀQBĀ"Z [1,4 ! Ā>,D "3'. Ā3" "%Ā3 J$A
T	0					Ā !"#$ %"ĀĀ +,-".
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		Ā<=>Ā?89 1Ā9 @ĀĀ%"ĀĀ#" #ĒĀF,4"ĀC.D,4"# ĀĀ<=> ĀĀ%22-"ĀĒ2I " C.DH"%ĀĀ3%"Ā,%ĒĀ3D "Ā %DĀB 2,-3ĒĀ#D.JĀK.2L 4,-!ĀC.DBĀ32ĀK%D JE Ā 22#ĀFDC "4 3 O	00	8 9 1Ā9		
		ĀP,Q RĀ; <RĀ?*;@Ā 2F3ĒĀ%3%"ĀF4"Ā-D4#ĒĀ3D "ĀC.DH"%ĀE 2,-3ĒĀ#D.J C.DBĀ32ĀK%D ĀĀ %D-ĒĀ 22#ĒĀ%D,-3Ā#"K.,-O	06 / 0	; / ;		
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		Ā<=>Ā?Ā @ĀĀ2.%ĀCĀD#"# ĒĀF,4"ĀC.D,4"# ĀĀ<=> ĀĀ%22-"ĀĒ "3ĒĀ%,C!3 C.DB-!ĀK.2L 4ĒĀĀ%3%DĀB3,4C".-Ā3. 2$C!2$3O	0a/5T	;		Ā / 0 1-%2ĀĀ !"#$ %" Ā ĀĀ ."'4
	^T	ĀP,Q RĀ; <RĀ?*;@Ā 2F3ĒĀ 2I "Ā-,%ĒĀ "3ĒĀ#D.JĀC.DBĀ32Ā#D.JĀK.2L 4,-! C.DBĒĀĀ ."BĀF,4"Ā-D4#Ā "DI -Ā3.2 $C2 $3O	07	Ā		
5		Ā<=>Ā?Ā @ĀĀ2.%ĀCĀD#"# ĒĀF,4"ĀC.D,4"# ĀĀ<=> ĀĀ%22-"ĀĒĀ%3ĀĀ %DĒB %DI4D3# ĒĀC.DBĀ32Ā#D.JĀC.DB	5 / 50	;		
		ĀP,Q RĀ; <RĀ?*;@Ā 2F3ĒĀ 2I "Ā-,%ĒĀ "3ĒĀ#D.JĀC.DBĀ32Ā#D.JĀK.2L 4,-! C.DB				
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+V] <+c ĀZ
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66T5Ā05^3 Ā<H"4$"
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ZĀ0 [167716T

+: YV*Q Z
8 .D4#ĀXDH'4 ĀN2D.#Ā2FĀ,C! 3ĀD4#Ā 2L".
+Ā9 "%ĀĀ3D%Ā2Ā3
0560Ā-Ā6.#ĀĀ3" "3
8 .D4#ĀXDH'4 EĀ , !,CD4

N: +P=8 ĀĀĀĀĀ !"%

V+] Ā +: YVQ ĀĀĀĀ6^ a6[^

ĀXVVQĀ0Ā ` Ā0

>+ P;;P =8 Ā: Q+< Q: +	V>< X2%%DĀĀ#P	V+] Ā+V +V ĀV=Q<QP V	N.,D4ĀN"D !
>+ P;;P =8 Ā : +V] <	Ā"D4ĀĀI ,3	: ` ` PV Ā: <QP:	X2%%DĀĀ#P
>+ P;;P =8 ĀV QX: >	X2%%2Ā3"I Ā<$C".-	>< QVZĀQ<+Q	0 _0^_5' 0a
>+ P;;P =8 Ā/b WP]V Q	8 $-Ā " J	` P=PĀX	0 _0^_5' 0a

8 V: 8 + < XPĀ : : +> P=< QVĀ	9 V;;Ā : =Ā Q+ W* QP:		9 V;; >V V;:] V=Q
?=<>Ā07^6ĀĀ3D3(%D4]Ā !,CD4ĀĀ2$3Ā?WĀĀ "" 3@@	+,-".	Ā ." "4	
: +QXP=8 0a[5 0&/0	] D3'.,DĀ >,D "3'.ĀP>@Z 2$Ā%4CZ	Sche le 40 PVC 2-inch Threaded	Sche le 40 PVC, 0 010-slot 2-inch Threaded
V<ĀQP=8 6^ a ^&[/ [a			] "3 2#Z Overp m ping >$.D3;24Z 0.5 ho r s 8 D%/Ā $.C" #Z30
V%"H3D24_Q2AĀ2FĀD -,4CĀV%"H5/0aĀ3_Ā0"T /5Ā3	9 "%%"Ā ,3ĀZ No permi re ire		

>V QX	V;:V <QP:	ĀQ+< Q<Ā+V Ā +P QP:	>V QX	WĀĀ	8 +< XPĀ;: 8	9 V;;Ā : =Ā Q+ W* QP:
		Ā<=>Ā?Ā9 @ĀĀ%Ā.ĀĀ#" #ĀĀ,4"ĀC.D,4"#ĀĀ<=>GĀ%22-"ĀĀ2I "Ā-,%ĀĀ%3%" C.DH'%ĀE 2,-3ĀĀC.DB,-!ĀK.2L 4ĀĀMI., J ĀD4#Ā 24 ."3 "ĀFDCI "4 3-/O		Ā9		D-,4CĀQBA" Z [1,4 ! Ā-,D "3'. Ā3" "%Ā3 J$A
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[	7T	Ā<=>Ā?Ā9 @ĀĀ%Ā.ĀĀ#" #ĀĀ,4"ĀC.D,4"#ĀĀ<=>GĀ%22-"ĀĀ%3%Ā ,%ĀĀ%3%" C.DH'%ĀE 2,-3ĀĀC.DB,-!ĀK.2L 4Ā2Ā#D.JĀK.2L 4	[	Ā9		
^		Ā<=>Ā?Ā9 @ĀĀ%Ā.ĀĀ#" #ĀĀ,4"ĀC.D,4"#ĀĀ<=>GĀ%22-"ĀĀ2I "Ā-,%ĀĀ3 -2I "ĀC.DH'%ĀĀD "Ā %DĀĀ 2,-3ĀĀC.DB-!ĀK.2L 4Ā2Ā#D.JĀK.2L 4E M 22#ĀFDCI "4 3-/O	^	Ā9		
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			05/aT			
0		Ā<=>Ā?Ā @ĀĀ2.%ĀCĀD#"# ĀĀ,4"ĀC.D,4"#ĀĀ<=> ĀĀ%22-"ĀĀ 2,-3Ā2Ā "3E C.DĀĀM "3ĀSĀ06LO		Ā		/ 0 1-%2ĀĀ !"#$ %" Ā ĀĀ ."" 4
		Ā<=>R ĀĀPQĀ?: ; @ĀF3ĀĀ%3%"Ā%DĀĀD "ĀF,4"Ā-D4#ĀĀ 2,-3Ā2Ā "3E #D.JĀC.DBĀ2Ā#D.JĀK.2L 4,-!ĀC.DBĀĀĀ,%ĀĀ2DI,O	0 /T	: ;		
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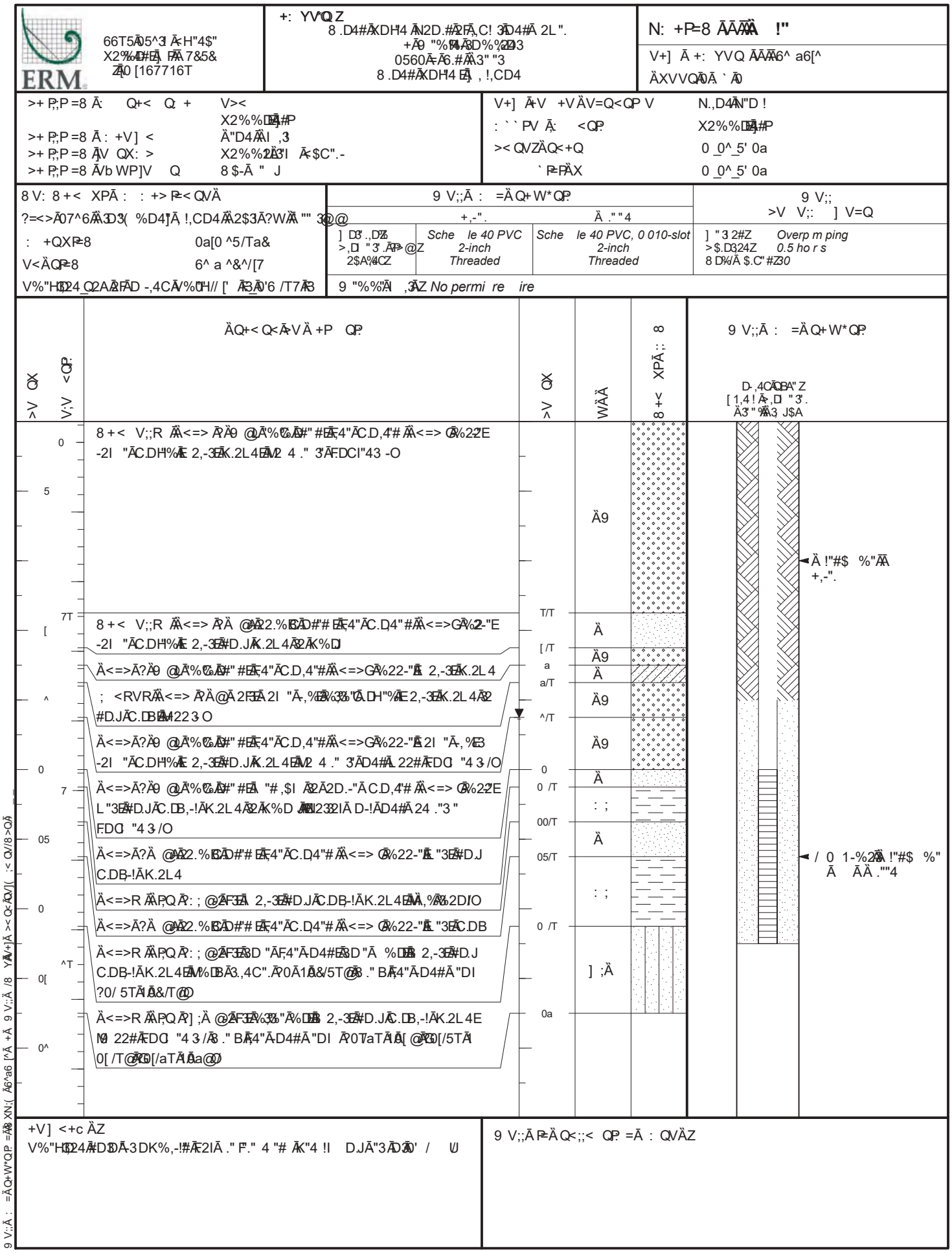
+V] <+c ĀZ
V%"H3D24Ā#D3DĀ-3DK%,-!Ā#ĀF2IĀ ." F." 4 "# ĀK"4 !I D.JĀ"3ĀD3Ā0' / U

9 V;;Ā P=Ā Q<;;< QP: =Ā : QVĀZ

9 V;:Ā : =Ā Q+W* QP: =ĀĀ8 XN;(Ā6^a6 [^Ā +Ā 9 V;:Ā /8 YĀ/+]Ā >< Q<ĀQV](;< QV/8 >Q/



Attachment B

EGLE Low Flow Discharge Records

Low Flow Discharge Request Record 8802

8/6/2020

Discharge Information

File No: 8802
County: OTTAWA
Basin: 14 - GRAND
Tn/Rng/Sec: 08N/16W/20
Permit No.: MI0058209
Issue Date: 1/14/2016
Watercourse GRAND RIVER
Facility: GRAND HAVEN BL&P
Lat/Long: 43.066667/86.234722
Drainage Area: 5574 sq. mi.

Frq	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
50	2180	2880	3280	3530	3830	7270	6820	4760	3260	2180	1860	1810
95	1220	1470	1520	1480	1670	2510	2920	2140	1530	1100	1080	1150

Harmonic Mean: **2750 cfs**

D90_Q10: **1290 cfs**

Access to the Low Flow Database is provided as a service to allow you to view the discharges from previous requests for preliminary design purposes. The discharge values are only valid for one year after the original request date. To obtain discharge information from the Hydrologic Studies Program, a low flow discharge request form may be submitted electronically to the DEQ. A written or email response to your request will be returned to you and must accompany your permit application.

Low Flow Discharge Request Record 8803

8/6/2020

Discharge Information

File No: 8803
County: OTTAWA
Basin: 14 - GRAND
Tn/Rng/Sec: 08N/16W/17
Permit No.: MI0058209
Issue Date: 1/14/2016
Watercourse GRAND RIVER N.CHANNEL
Facility: GRAND HAVEN BL&P
Lat/Long: 43.0775/86.229167
Drainage Area: 5570 sq. mi.

Frq	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
50	2070	2740	3120	3360	3640	6910	6480	4520	3100	2070	1770	1730
95	1170	1400	1450	1420	1590	2390	2780	2040	1460	1050	1030	1100

Harmonic Mean: **2610 cfs**

D90_Q10: **1230 cfs**

Access to the Low Flow Database is provided as a service to allow you to view the discharges from previous requests for preliminary design purposes. The discharge values are only valid for one year after the original request date. To obtain discharge information from the Hydrologic Studies Program, a low flow discharge request form may be submitted electronically to the DEQ. A written or email response to your request will be returned to you and must accompany your permit application.