Location Restriction Demonstrations

DTE Electric Company

Monroe Power Plant Inactive Bottom Ash Impoundment

April 2020

Prepared For:

DTE Electric Company

Prepared By:

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APPENDICES

Certification

I, the undersigned Michigan Professional Engineer, hereby certify that I am familiar with the technical requirements of Title 40 Code of Federal Regulations Part 257 Subpart D (§257). I also certify that it is my professional opinion that, to the best of my knowledge, information, and belief, that the information in this demonstration is in accordance with current good and accepted engineering practice(s) and standard(s) and meets the requirements of §257.60 through §257.64.

For the purpose of this document, "certify" and "certification" shall be interpreted and construed to be a "statement of professional opinion." The certification is understood and intended to be an expression of my professional opinion as a Michigan Licensed Professional Engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.

Seal/Date

Name

4/14/2020

License No: 6201042332

Expires: October 31, 2021

1.0 Background

The purpose of this document is to determine whether the inactive Coal Combustion Residual (CCR) inactive Bottom Ash Impoundment (BAI) at the Monroe Power Plant (MONPP) is in compliance with the location restrictions outlined in the Environmental Protection Agency's (EPA) final CCR rule [Title 40 Code of Federal Regulations Parts 257 and 261] Subpart D – "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments" (§257.60 through §257.64, federal rule). The BAI is an inactive CCR surface impoundment.

This document includes information from a desktop study, well installation activities, and engineering calculations to demonstrate whether or not the inactive BAI is in compliance with location restrictions (§257.60 through §257.64).

Supporting documents are provided as appendices to this demonstration.

1.1 Facility and CCR Unit Information

The MONPP is located in Section 16, Township 7 South, Range 9 East, at 3500 Front Street, Monroe in Monroe County, Michigan. The inactive BAI was operated from the mid-1970s through 2015 and is located within the southern portion of the MONPP parcel at latitude 41° 52' 30" North and longitude 83° 20' 70" West. The MONPP inactive BAI is bounded by the MONPP facility to the north and northeast, Lake Erie to the southeast, process water pond to the south, and discharge canal to the west. DTE Electric is currently planning to close the MONPP inactive BAI by removing all CCR material from the basin. The design for the closure by removal is ongoing.

1.2 Site Setting

The MONPP inactive BAI CCR unit is located immediately east of the discharge canal and immediately north and east of Lake Erie. The bedrock in the site vicinity is overlain by approximately 40 to 50 feet of unconsolidated deposits of glacial origin. The deposits are comprised of two (2) distinct units: a hard glacial till immediately overlying bedrock, and lacustrine (lake bed or lake shore) deposits which overlay the till unit. The till is comprised of over consolidated (highly compacted) gray silty to sandy clay with some cobbles and boulders, and ranges from approximately 20 to 50 feet in thickness. The overlying lacustrine deposits are composed of 10 to 30 feet of fine-grained sand and silt with some soft clay except where there is a thin, discontinuous coarse sand unit at the base of the lacustrine sequence. The uppermost aquifer at the MONPP inactive BAI consists of this fine-grained sand unit and is located at a depth of 18 to 37 ft below ground surface.

A groundwater monitoring system has been established for the MONPP inactive BAI CCR unit as detailed in the Monitoring Well Installation Report – Inactive Bottom Ash Basin, DTE Monroe Plant (Well Installation Report) (AECOM, April 2019). The detection monitoring well network for the MONPP inactive BAI CCR unit currently consists of twelve monitoring wells that are screened in the uppermost aquifer. The monitoring well boring logs are included in Appendix A.

Under parts of the Plant, the Inactive BAI, and Process Pond areas, this sand unit ranges in thickness from 5 to 20 feet. The sand unit thins progressively to the west, having a thickness of approximately 12 feet on the east side of the discharge canal and thinning to less than a few feet approximately 150 feet to the west of the discharge canal. Further to the west the sand unit is

not evident in soil borings for monitoring wells drilled in 2016 around the Fly Ash Basin. This is consistent with the expectation that lake-deposited materials will decrease in thickness with distance away from Lake Erie. Accordingly, it appears that this sand unit is a localized lakeshore beach deposit formed by westward aggradation with rising lake level and subsequently blanketed by finer lacustrine deposits. Groundwater in the sand unit is under semi-confined conditions with groundwater elevations ranging between approximately 572.6 and 575.6 feet above mean sea level (msl).

A mean hydraulic conductivity of approximately 125 feet/day was averaged from the hydraulic conductivity values calculated for MW-1S, MW-3S, MW-7S, and MW-8S during aquifer testing as described in the Well Installation Report. Potentiometric groundwater elevation data collected from 2017 through 2019 shows that horizontal groundwater flow within the upper aquifer unit is generally to the south and southeast toward Lake Erie. The hydraulic gradient toward the southeast in May 2019 was 0.0017 foot/foot.

2.0 Location Restrictions

The assessments for location restrictions designated in the federal CCR rule are presented below. The location restrictions include placement above the uppermost aquifer, within wetlands, near fault areas, within seismic impact zones, and unstable areas based on available geologic and geomorphological information. Supporting information for the demonstrations is included in the appendices to this report.

2.1 §257.60 – Placement Above the Uppermost Aquifer

The federal CCR rule requires that CCR units such as the MONPP inactive BAI must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in the groundwater elevations (including the seasonal high water table). As discussed in Section 1.2 and shown on the cross-sections included in Appendix A, the uppermost aquifer at the inactive BAI is the fine-grained sand unit. Soil borings completed at the inactive BAI indicate that the ash in some locations, for example at boring 741, extends down to within 5 feet of the uppermost aquifer.

Based on this demonstration, the base of the MONPP inactive BAI CCR unit is not uniformly located greater than 5 feet above the upper limit of the uppermost aquifer. Therefore, the MONPP inactive BAI CCR unit is not in compliance with the requirements of §257.60 and is subject to closure requirements under 40 CFR 257.101(b)(1).

2.2 §257.61 – Wetlands

The CCR location standards restrict existing and new CCR surface impoundments from being located in wetlands, as defined at 40 CFR 232.2 (40 CFR 257.61(a)). Wetlands are defined in 40 CFR 232.2 *Waters of the United States (3)(iv)* as, "…those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." TRC reviewed National Wetland Inventory (NWI) maps and Michigan Resource Information System (MIRIS) Land Cover Maps archived and available through Michigan Department of Natural Resources (MDNR), Michigan Resource Inventory Program (MRIP) to ascertain whether or not the MONPP inactive BAI is located in wetlands.

As shown on the NWI map in Appendix C, soils at and in the vicinity of the site are designated as wetland soils, most likely due to the proximity of the site to Plum Creek and Lake Erie. The inactive MONPP BAI CCR unit is identified as wetlands on NWI and MIRIS maps. In addition, the NWI (2005) recognizes areas within the BAI as wetlands. However, per the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, Section 324.30305(4)(b), a wetland incidentally created as a result of construction and operation of a water treatment pond, lagoon, or storm water facility in compliance with the requirements of state or federal water pollution control laws is not subject to regulation. The inactive BAI was constructed as a settling pond for the National Pollutant Discharge Elimination System (NPDES) permit. As such, the inactive BAI is a water treatment pond exempt from Michigan wetland regulations and would not be considered a wetland.

Based on TRC's review of wetland inventory resources and current site conditions, the MONPP inactive BAI CCR unit is not located within wetlands as defined in 40 CFR 232.2 and as such, is in compliance with the requirements of §257.61.

2.3 §257.62 – Fault Areas

The federal CCR rule requires that CCR units not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time (within the most recent 11,700 years) unless the owner or operator demonstrates that an alternative setback distance of less than 60 meters (200 feet) will not cause damage to the structural integrity of the CCR unit. United States Geologic Survey (USGS)-recognized Quaternary faults in the U.S. are shown on the map in Appendix D.

The lower peninsula of Michigan is covered by a mantle of glacial deposits obscuring any surficial evidence of faulting (Bricker, 1977). In these areas of glacial deposition, fault zones are considered to be stable, and any recent recorded earth movement in Michigan has been noted to originate from source depths of 95 to 110 kilometers into the subsurface (Brinker, 1977). Historical records indicate that nearly all seismic events that have occurred in Michigan have been relatively minor in intensity (I to VI on the Modified Mercalli Intensity Scale).

There is no evidence of active faulting during the Holocene in the MONPP inactive BAI CCR unit; therefore, the MONPP inactive BAI CCR unit is in compliance with the requirements of §257.62.

2.4 §257.63 – Seismic Impact Zone

The federal CCR rule requires that CCR units not be located in seismic impact zones unless the owner or operator demonstrates that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site. The federal CCR rule defines a seismic impact zone as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitation pull (g), will exceed 0.10 g in 50 years."

To determine whether the MONPP inactive BAI CCR unit is located in a seismic impact zone, the USGS National Seismic Hazard Mapping Project (NSHMP) Unified Hazards Tool was consulted to determine the earthquake hazard for the inactive BAI. The Unified Hazard Tool utilizes USGS hazard models to evaluate the hazard curves and hazard response spectrums for a location.

Using the updated Conterminous U.S. 2014 dynamic mode (v4.2.0), the Unified Hazard Tool indicates a mapped peak ground acceleration (PGA) of 0.0624 g for the MONPP inactive BAI CCR unit area (Appendix E). This calculated PGA is less than 0.10 g in 50 years.

There is no evidence of a seismic impact zone in this determination; therefore, TRC concludes that the MONPP inactive BAI CCR unit is not located in a seismic impact zone. Therefore, MONPP inactive BAI CCR unit is in compliance with the requirements of §257.63.

2.5 §257.64 – Unstable Areas

The federal CCR rule requires that CCR units not be located in an unstable area unless the owner or operator demonstrates that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted. Factors associated with soil conditions resulting in significant differential settlement, geologic or geomorphologic features, and human-made features or events must be evaluated to determine compliance.

This demonstration was performed by reviewing local geology and topography and evaluating the results of the Structural Stability Assessment (AECOM, 2019) and Safety Factor Assessment (AECOM, 2019).

Soil borings and monitoring well installations at the MONPP inactive BAI identified overlying lacustrine deposits consisting of fine-grained sand and silt with some soft clay. Below the lacustrine deposits is glacial till consisting of overconsolidated silty to sandy clay. The clay and silt exhibit a very stiff to hard consistency, with harder soils noted with depth. The glacial till occurs above weathered and competent limestone bedrock. Based on these geotechnical records, there is no evidence of unstable soil or underlying bedrock conditions proximal to the MONPP inactive BAI CCR unit.

Based on information maintained by the Michigan Natural Features Inventory and Michigan State University Extension, Monroe County topography, due to the presence of underlying limestone bedrock, is subject to the potential but infrequent occurrence of sinkholes and caves. However, no evidence of sinkholes or caves have been discovered or noted at the MONPP property and therefore are not expected to contribute to the development of unstable site soil conditions.

In 2019, AECOM performed a slope stability safety factor assessment and an overall structural stability assessment for the MONPP inactive BAI CCR unit. The slope stability assessment for the inactive BAI berms concluded that the inactive BAI meets the safety factor requirements under both steady state (normal) and maximum surcharge conditions. The structural stability assessment further concluded that the inactive BAI meets all structural stability criteria under the CCR Rule.

In this determination, there is no evidence of unstable areas due to:

- soil conditions resulting in significant differential settling,
- geologic or geomorphologic features, or
- human-made features or events

Therefore, it is TRC's opinion that MONPP inactive BAI CCR unit is not located in an unstable geological area and that the inactive BAI berm meets safety factor requirements at current operating conditions and berm structural conditions. Therefore, the MONPP inactive BAI CCR unit, is in compliance with the requirements of §257.64.

3.0 Conclusions

Based on the evaluation provided in this documentation, the MONPP inactive BAI CCR unit is not in compliance with the location restrictions provided in §257.60 of the CCR rule. Accordingly, the MONPP inactive BAI must cease receipt of CCR and non-CCR waste streams. The MONPP inactive BAI CCR unit ceased placement of CCR in 2015 and is currently being prepared to undergo closure by removal of CCR. Therefore, no further action is required after this demonstration has been placed into the operating record, posted to the publicly-accessible website, and government notifications provided.

4.0 References

AECOM. March 2018, revised August 2019. Safety Factor Assessment Report - Inactive Bottom Ash Impoundment DTE Monroe Power Plant.

AECOM. April 2019, revised August 2019. Monitoring Well Installation Report Coal Combustion Residuals (CCR) Rule - Inactive Bottom Ash Impoundment DTE Monroe Power Plant, Monroe, Michigan.

AECOM. August 2019. CCR Certification: Structural Stability Assessment - Inactive Bottom Ash Impoundment DTE Monroe Power Plant.

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Nicholson, S.W., Dicken, C.L., Foose, M.P., and J. Mueller. 2004. Integrated geologic map databases for the United States, the upper midwest states: Minnesota, Wisconsin, Michigan, Illinois, and Indiana. U.S. Geologic Service. Available online at https://mrdata.usgs.gov/geology/state/map-us.html#home. Accessed [3/12/2020].

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United States Fish and Wildlife Service. 2010. “Wetlands Mapper.” National Wetlands Inventory. Available online at http://geohazards.usgs.gov/deaggint/2008/. Accessed [3/9/2020].

United States Geological Survey (USGS). 2019. Unified Hazard Tool. Available Online at https://earthquake.usgs.gov/hazards/interactive/. Accessed [3/12/2020].

USGS. U.S. Quaternary Faults and Fold Database. USGS Geologic Hazards Science Center, Golden, CO Available online at https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=db287853794f4555b8e93e42290e9716. Accessed [9/7/2018].

Appendix A
Monitoring Well Boring Logs

MON-PP-0068-16

DTE Monroe Plant
Area 15 Monitoring Well and Soil Boring Summary
Monroe, Michigan

Well ID	Well Elevation ft BTOC	Ground Surface Elevation feet	Northing (ft)	Easting (ft)	Total Boring Depth ft bgs	Well Screen Interval (feet bgs)		Well Type	Location
						Top	Bottom		
MW-1D	582.82	579.4	140178.92	13401952.04	80	70	80	Bedrock	Area 15 East
MW-1S	582.62	579.8	140176.14	13401951.05	41	31	41	Unconsolidated	Area 15 East
MW-2S	578.85	579.2	139070.06	13401077.48	50	31	41	Unconsolidated	Area 15 Southeast
MW-3D	577.42	578.0	139422.09	13399871.16	80	69	79	Bedrock	Area 15 Southwest
MW-3S	577.58	578.1	139417.18	13399871.43	40	30	40	Unconsolidated	Area 15 Southwest
MW-4S	580.67	578.1	141163.06	13401614.14	40	27	37	Unconsolidated	Area 15 Northeast
MW-5S	584.50	581.7	142564.92	13401176.41	70	13	23	Unconsolidated	Area 15 North
MW-7D	576.17	576.7	141099.21	13399510.92	70	59	69	Bedrock	Area 15 West
MW-7S	576.20	576.6	141102.76	13399510.36	34	24	34	Unconsolidated	Area 15 West
MW-8D	586.45	583.7	140561.00	13397828.00	70	56.5	66.5	Bedrock	Fly Ash Basin (west of discharge canal)
MW-8S	586.59	583.7	140560.53	13397828.28	43	33	43	Unconsolidated	Fly Ash Basin (west of discharge canal)
SB-5*	NS	NS	142313.54	13400621.21	70	NA	NA	NA	Area 15 North/Northwest (soil boring only)
SB-6*	NS	NS	139982.04	13400703.89	80	NA	NA	NA	Area 15 - Middle of Separation Berm (soil boring only)

NS - Not Surveyed
NA - Not Applicable
Monitoring Well Coordinate System:NAD83_2011+NAVD88
*Soil Boring Coordinate Source: GIS Software data points converted using: https://beta.ngs.noaa.gov/gtkweb/

MON-PP-0068-16

Discharge Canal

Conveyance Lines to Fly Ash Basin

MW-5S

SB-5

MW-7S/7D

MW-4S

MW-8S/8D

MW-1S/1D

SB-6

Separation Berm

MW-3S/3D

MW-2

Lake Erie

Aerial Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community and Google Earth 2016 Aerial Imagery

Document Path: J:\Project\GIS\D\DTE\Monroe Plant\DTE_Monroe_MI_Well Location Map_072516.mxd

LEGEND:

- Proposed Investigation Location - Bottom-Ash Basin Area
- Proposed Investigation Location - Fly-Ash Basin Area
- Soil Boring
- Unit Separation Berm
- Approximate Plant Boundary
- Approximate Boundary of Inactive Bottom Ash Basin

N

0 720 1,440 Feet

DTE Energy

Monroe Power Plant

FIGURE 2
PROPOSED
GROUNDWATER INVESTIGATION
LOCATIONS MAP

DATE: 10/17/2016	SCALE 1 inch = 720 feet
CREATED BY: KLP	
JOB NO. 60489524	

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1D

Sheet 1 of 3

MON 856

Date(s) Drilled	**9/15/16 to 9/19/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**80.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**579.4 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**582.82 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**Artesian (flowing) [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Dark gray, well graded SAND (SW); loose; some gravel, trace silt and clay; fill materials		Steel Pro-Casing
						Black, poorly graded SAND (SP); trace gravel, little silt and clay, moist (Ash)		
575	5	10	8.5	85				
						Black CLAY (CH); high plasticity; little sand, trace gravel, moist		
								Bentonite Grout
570						Gray CLAY (CL); hard; moist; little gravel		
	10					Dark gray SAND (SW); well graded; trace gravel;wet		2" ID schedule 40 PVC riser
						Dark brown CLAY (CH); high organic/peat content; moist		
565	15	10	10	100		Grades with peat, small shells		
560	20					Gray SILT (ML); some fine sand increasing with depth; wet		
555	25	10	8.0	80				
550	30							

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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1D
Sheet 2 of 3

MON 856

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						
						Dark gray fine SAND (SP-SM); poorly graded; some silt; wet	
545	35	10	8.5	85			
						same as above; decayed wood present	
						Gray GRAVEL (GW); rounded; well graded; trace clay; wet	Bentonite Grout
540	40						2" ID schedule 40 PVC riser
						Gray CLAY (CL); glacial till; hard; trace fine sand; moist	
535	45	10	10	100			
530	50	5	5.0	100			
						Highly weathered LIMESTONE-SHALE (large bedrock inclusion in till)	
525	55	5	5.0	100		Gray CLAY (CL); glacial till; very hard; trace medium sand; dry	
520	60	5	0.5	10			
515	65						

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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1D
Sheet 3 of 3

MON 856

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
510	70	5	2.75	55			Bentonite Grout 2" ID schedule 40 PVC riser Bentonite Seal
505	75	5	4.0	80		LIMESTONE-SHALE (bedrock); gray, highly weathered; wet; some intact 2"-3"	SCH 40 PVC 2" Diameter 0.01" Slotted Screen Clean silica sand
500	80	5	5.0	100		LIMESTONE (bedrock); gray, slightly weathered; breaks apart with hammer blows; moist to wet	End of boring
495	85						
490	90						
485	95						
480	100						

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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1S

Sheet 1 of 2

MON 857

Date(s) Drilled	**9/15/16 to 9/19/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**41.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**579.8 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**582.62 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**9.42' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0							Steel Pro-Casing
						Dark gray well graded SAND (SW); loose; some ash; fill materials		
575	5	10	8.5	85				
						Black CLAY (CH); high plastiscity; moist		
								Bentonite Grout
						Gray CLAY (CL); hard; moist; little gravel		
570	10							
						Dark gray SAND (SW); well graded; trace gravel;wet		2" ID schedule 40 PVC riser
						Dark brown CLAY (CH); high organic-peat content; moist		
565	15	10	10	100				
560	20					Gray SILT (ML); some fine sand; wet		
555	25	10	8.0	80				Bentonite Seal
								Clean silica sand
550	30							

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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-1S
Sheet 2 of 2

MON 857

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						2" ID schedule 40 PVC riser
							SCH 40 PVC 2" Diameter 0.01" Slotted Screen
545	35	10	8.5	85		Dark gray fine SAND (SP-SM); poorly graded; some silt; wet	
							Clean silica sand
						same as above; decayed wood present	
540	40					Gray GRAVEL (GW); rounded; well graded; trace clay; wet	
							End of boring
535	45	10	10	100			
530	50						
525	55						
520	60						
515	65						

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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-2S

Sheet 1 of 2

MON 858

Date(s) Drilled	**9/19/16 to 9/19/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**50.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**579.2 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**578.85 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**4.91' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					ASPHALT Gray SAND (SW-SM); well graded; with silt; some gravel		
575	5	10	1.0	10				Bentonite Grout
570	10					Dark gray CLAY (CH); high plasticity; trace silt; wood debris-organic materials; moist		2" ID schedule 40 PVC riser
565	15	10	7.5	75				
560	20							
555	25	10	6.0	60		Brown CLAY (CH); high plasticiity; some mottling; little gravel; moist; hard @ 26'		Bentonite Seal
550	30							

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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-2S

Sheet 2 of 2

MON 858

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						2" ID schedule 40 PVC riser
						Dark gray CLAY (CL); trace coarse sand; little gravel; very hard; dry-moist	SCH 40 PVC 2" Diameter 0.01" Slotted Screen
545	35	10	8.5	85			Clean silica sand
						Dark gray SAND (SP-SM); poorly graded; fine grained; some silt; wet	
540	40						
						Dark gray SAND (SP); poorly graded; wet	
						Dark Gray CLAY (CL); glacial till; very hard, trace gravel and sand; moist	Bentonite Seal
535	45	10	8.0	80			
530	50						End of boring
525	55						
520	60						
515	65						

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:24:57 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-3D

Sheet 1 of 3

MON 859

Date(s) Drilled	**9/20/16 to 9/20/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**80.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**578.0 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**577.42 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**Artesian (flowing) [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					ASPHALT-GRAVEL		
						Brown SAND (SW); well graded; some gravel		
575								
	5	10	2.75	27.5		Dark yellow-brown CLAY (CL); very stiff; little gravel; moist		
570								Bentonite Grout
	10					Dark gray CLAY (CH); high plasticity; some organic materials; stiffer with depth; moist to wet		2" ID schedule 40 PVC riser
565								
	15	10	10	100				
						Dark gray CLAY (CL); hard; gray mottling; little gravel		
560								
	20							
555								
	25	10	10	100		Dark gray SAND (SP-SM); poorly graded with silt; medium dense; trace gravel		
						Dark gray SAND (SP); poorly graded; fine grained; medium dense; moist		
550								
	30							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:25:05 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-3D
Sheet 2 of 3

MON 859

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						
545						Dark gray SAND (SP-SM); poorly graded with silt; fine grained; higher silt content at depth; wet	
	35	10	9.5	95			
						Gray SILT (ML); soft; little fine sand; wet	
540							Bentonite Grout
	40					Dark gray CLAY (CL); glacial till; hard; trace gravel and sand; moist	2" ID schedule 40 PVC riser
535							
	45	10	5.5	55			
530							
	50						
525							
	55	10	5.5	55			
520							
	60						
		10	3.0	30		Gray highly weathered LIMESTONE (bedrock inclusion in till); some granite pebbles	
515							
	65					Dark gray CLAY (CL); glacial till; hard; trace gravel; moist	Bentonite Seal

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:25:07 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-3D
Sheet 3 of 3

MON 859

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
510	70	10	3.0	30		Light gray SH (bedrock); highly weathered; broken from drilling process; moist to wet	Bentonite Seal 2" ID schedule 40 PVC riser SCH 40 PVC 2" Diameter 0.01" Slotted Screen
505	75	10	4.0	40		Gray LIMESTONE (bedrock); weathered; some intact sections (< 3" long); moist to wet	Clean silica sand
500	80					Pale brown LIMESTONE (bedrock); highly weathered 1-2" long pieces	End of boring
495	85						
490	90						
485	95						
480	100						

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-3S

Sheet 1 of 2

MON 860

Date(s) Drilled	**9/20/16 to 9/20/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**40.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**578.1 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**577.58 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**3.76' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					ASPHALT-GRAVEL		
						Brown SAND (SW); well graded; some gravel		
575								
	5	10	2.75	27.5		Dark yellow-brown CLAY (CL); very stiff; little gravel; moist		
570								Bentonite Grout
	10					Dark gray CLAY (CH); high plasticity; some organic materials; stiffer with depth; moist to wet		2" ID schedule 40 PVC riser
565								
	15	10	10	100				
						Dark gray-brown CLAY (CL); hard; gray mottling; little gravel		
560								
	20							
555								
	25	10	10	100		Dark gray SAND (SP-SM); poorly graded with silt; medium dense; trace gravel		Bentonite Seal
						Dark gray SAND (SP); poorly graded; fine grained; medium dense; moist		
550								Clean silica sand
	30							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:25:16 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-3S
Sheet 2 of 2

MON 860

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
	30						SCH 40 PVC 2" Diameter 0.01" Slotted Screen
545						Dark gray SAND (SP-SM); poorly graded with silt; fine grained; higher silt content at depth; wet	2" ID schedule 40 PVC riser
	35	10	9.5	95			Clean silica sand
540						Gray SILT (ML); soft; little fine sand; wet	
	40						End of boring
535							
	45	10	5.5	55			
530							
	50						
525							
	55						
520							
	60						
515							
	65						

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:25:18 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-4S

Sheet 1 of 2

MON 861

Date(s) Drilled	**9/26/16 to 9/26/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**40.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**578.1 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**580.67 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**5.82' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Brown SAND (SW); well graded with gravel		Steel Pro-Casing
575						Dark gray SAND (SW); well graded; moist		
	5	10	5.5	55				
						Brown CLAY (CH); high plasticity; trace gravel and coarse sand; moist		
570								Bentonite Grout
	10							2" ID schedule 40 PVC riser
						Dark gray CLAY (CH); high plasticity; some organic material-peat		
565								
	15	10	5.0	50				
560								
	20					Gray SILT (ML) with fine sand; wet		Bentonite Seal
555								
	25	10	7.5	75				Clean silica sand
								SCH 40 PVC 2" Diameter 0.01" Slotted Screen
550						Dark gray SAND (SW); well graded; loose; trace gravel; wet		
	30							

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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-4S
Sheet 2 of 2

MON 861

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
	30							2" ID schedule 40 PVC riser
545								SCH 40 PVC 2" Diameter 0.01" Slotted Screen
	35	10	7.5	75		Dark gray SILT (ML) with fine sand; wet		Clean silica sand
						Gray CLAY (CL); glacial till; hard'; trace gravel and coarse sand		Bentonite Seal
540								
	40							End of boring
535								
	45							
530								
	50							
525								
	55							
520								
	60							
515								
	65							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:25:26 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-5S

Sheet 1 of 3

MON 862

Date(s) Drilled	**10/4/16 to 10/4/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**70.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**581.7 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**584.50 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**5.81' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0							Steel Pro-Casing
						Black SAND (SW); well graded; little gravel; moist (FILL)		Bentonite Seal
580		5	0	0		Gray fine SAND (SP-SM) with silt and gravel; moist		
	5							2" ID schedule 40 PVC riser
575		5	4.0	40				
	10					Gray silty CLAY (CL); low plasticity; soft; little organic material; moist		
570						Dark brown CLAY (CL); high plasticity; some organic material; small shells; moist		SCH 40 PVC 2" Diameter 0.01" Slotted Screen
	15	10	7.0	70				
565								Clean silica sand
	20					Gray CLAY (CL) with fine sand and silt; soft; trace organic material; sand-silt decrease with depth; wet		
560								
						Gray CLAY (CH); brown mottling; high plasticity; little gravel; moist		Bentonite Chip
	25	10	8.5	85		Gray CLAY (CL); brown mottling; hard; low plasticity; moist; very hard starting at 34 feet		
555								
	30							

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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-5S
Sheet 2 of 3

MON 862

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
550	30						
	35	10	7.5	75			
545							
	40						Bentonite Chip
540						Gray CLAY (CH); brown mottling; high plasticity; little gravel; moist	
	45	10	8.5	85		Gray CLAY (CL); glacial till; very hard; moist to dry	
535							
	50						
530							
	55	10	5.5	55			
525							
	60						
520		5	4.0	80			
	65						

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:25:36 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-5S
Sheet 3 of 3

MON 862

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
515		5	4.0	80		Gray LIMESTONE (bedrock); higly weathered; dry from drilling methods but zone produces water		Bentonite Chip
	70							End of boring
510								
	75							
505								
	80							
500								
	85							
495								
	90							
490								
	95							
485								
	100							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:25:37 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7D

Sheet 1 of 3

MON 863

Date(s) Drilled	**9/28/16 to 9/28/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**70.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**576.7 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**576.17 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**Artesian (flowing) [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Gray gravel FILL		
575						Brown CLAY (CH); high plasticity; some organic materials and shells; moist		
	5	10	5.5	55				
570								Bentonite Grout
	10							2" ID schedule 40 PVC riser
565								
	15	10	8.5	85				
560						Gray CLAY(CH); high plasticity; trace fine sand; moist		
						Gray SAND (SP-SM) with silt; trace organic fragments; wet		
	20							
555								
						Gray fine SAND (SP); some silt; wet		
	25	10	8.5	85		Gray SAND (SW); well graded; little gravel; wet		
550								
	30							

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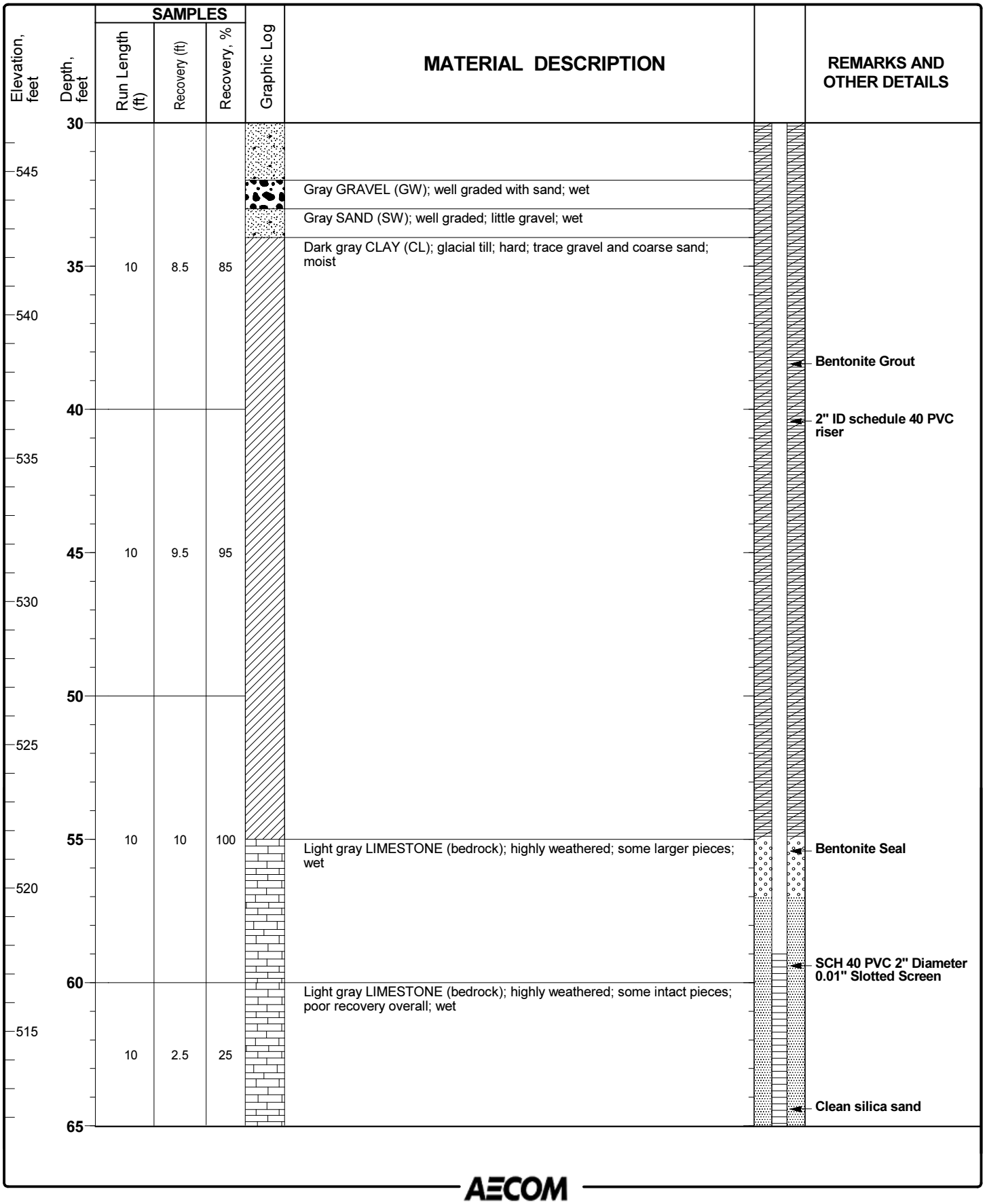
AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7D
Sheet 2 of 3

MON 863



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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7D
Sheet 3 of 3

MON 863

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
510		10	2.5	25			2" ID schedule 40 PVC riser SCH 40 PVC 2" Diameter 0.01" Slotted Screen Clean silica sand Collapse
	70						End of boring
505							
	75						
500							
	80						
495							
	85						
490							
	90						
485							
	95						
480							
	100						

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:25:53 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7S

Sheet 1 of 2

MON 864

Date(s) Drilled	**9/28/16 to 9/28/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**34.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**576.6 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**576.20 ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**2.74' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0					Gray gravel FILL		
575						Brown CLAY (CH); high plasticity; some organic materials and shells; moist		
	5	10	5.5	55				
570								Bentonite Grout
	10							2" ID schedule 40 PVC riser
565								
	15	10	8.5	85				
560						Gray CLAY(CH); high plasticity; trace fine sand; moist		
						Gray SAND (SP-SM) with silt; trace organic fragments; wet		
	20							Bentonite Seal
555								
						Gray fine SAND (SP); some silt; wet		
	25	10	8.5	85				SCH 40 PVC 2" Diameter 0.01" Slotted Screen
						Gray SAND (SW); well graded; little gravel; wet		
550								
	30							Clean silica sand

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:01 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-7S

Sheet 2 of 2

MON 864

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
545	30	4	3.4	85		Gray GRAVEL (GW); well graded with sand; wet		2" ID schedule 40 PVC riser
								SCH 40 PVC 2" Diameter 0.01" Slotted Screen
						Gray SAND (SW); well graded; little gravel; wet		Clean silica sand
								End of boring
540	35							
535	40							
530	45							
525	50							
520	55							
515	60							
	65							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:02 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8D

Sheet 1 of 3

MON 865

Date(s) Drilled	**9/29/16 to 9/30/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**70.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**583.7 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**586.45 ft msl**
Boring Location	**Fly Ash Basin**	Groundwater Level(s)	**Artesian (flowing) [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0							Steel Pro-Casing
						Brown SAND (SW); well graded; trace gravel and silt; moist		
580								
	5	10	5.5	55				
						Gray SILT (ML) with fine sand; trace organic material; some thin black colored layers; wet		
575								Bentonite Grout
	10							2" ID schedule 40 PVC riser
570								
	15	10	5.5	55				
						Dark gray CLAY (CH); high plasticity; trace organic material; small shells		
565								
						Brown CLAY(CH); high plasticity; little coarse sand and gravel; gray mottling; moist		
	20							
560								
						Gray CLAY (CL); hard; low plasticity; trace coarse sand and gravel; moist		
	25	10	10	100				
555								
	30							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:11 PM

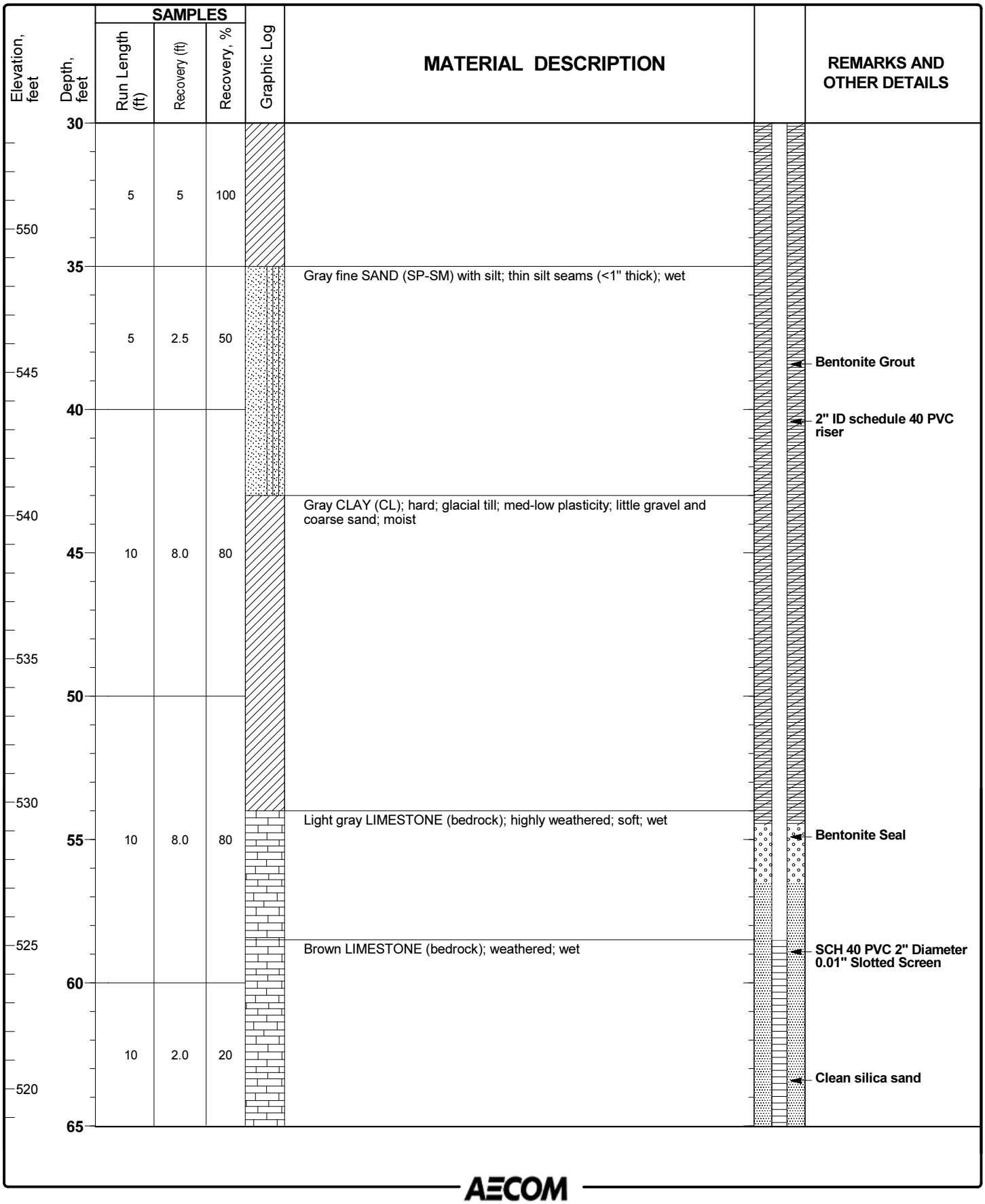
AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8D
Sheet 2 of 3

MON 865



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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8D
Sheet 3 of 3

MON 865

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
515	70	10	2.0	20				2" ID schedule 40 PVC riser SCH 40 PVC 2" Diameter 0.01" Slotted Screen Clean silica sand
								End of boring
510	75							
505	80							
500	85							
495	90							
490	95							
485	100							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:14 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8S

Sheet 1 of 2

MON 866

Date(s) Drilled	**9/29/16 to 9/30/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**43.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**583.7 ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**586.59 ft msl**
Boring Location	**Fly Ash Basin**	Groundwater Level(s)	**11.86' BTOC [Measurement after development]**		

Elevation, feet	Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
	0							Steel Pro-Casing
580						Brown SAND (SW); well graded; trace gravel and silt; moist		
	5	10	5.5	55				
						Gray SILT (ML) with fine sand; trace organic material; some thin black colored layers; wet		
575								Bentonite Grout
	10							2" ID schedule 40 PVC riser
570								
	15	10	5.5	55				
						Dark gray CLAY (CH); high plasticity; trace organic material; small shells		
565								
						Brown CLAY(CH); high plasticity; little coarse sand and gravel; gray mottling; moist		
	20							
560								
						Gray CLAY (CL); hard; low plasticity; trace coarse sand and gravel; moist		
	25	10	10	100				
555								Bentonite seal
	30							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:21 PM

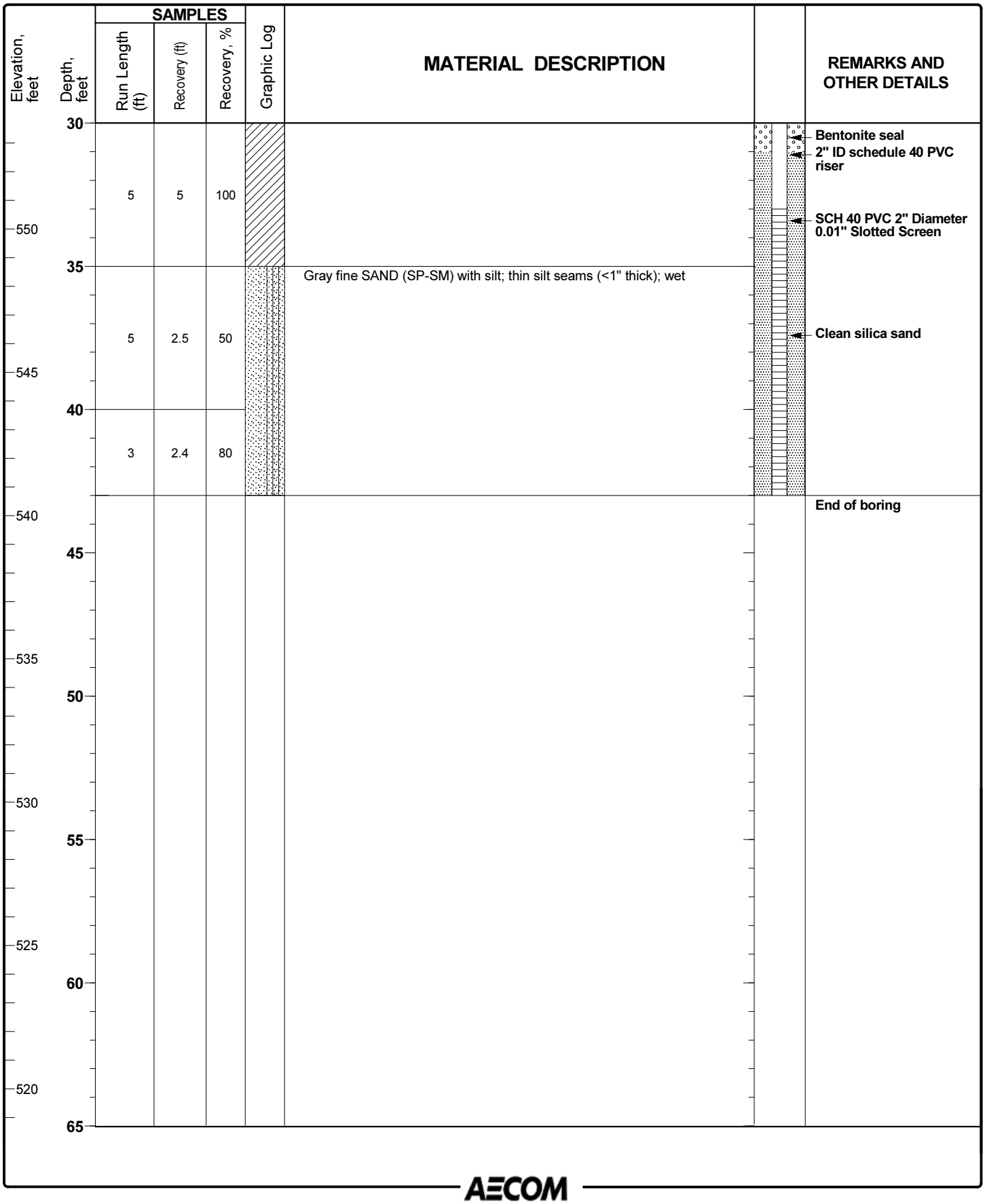
AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of MW-8S
Sheet 2 of 2

MON 866



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AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of SB-5

Sheet 1 of 3

MON 867

Date(s) Drilled	**9/27/16 to 9/27/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**70.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**N/A**		

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0					Dark brown SAND (SW); well graded; trace gravel; small pieces of coal (FILL)		
5	10	7.0	70		Gray fine SAND (SP); poorly sorted; some silt; moist to wet; water odor (strong organic decay-like smell) starting at (FILL)		
10	10	7.5	75				
15							
20	10	2.0	20				
25							
30							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTEMONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:27 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of SB-5
Sheet 2 of 3

MON 867

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER DETAILS
30						
					Dark gray SILT (ML); soft; some clay; wet	
35	10	8.5	85		Gray fine SAND (SP-SM) with silt; trace organic fragments; wet	
					Gray SILT (CL-ML) with clay; low plasticity; gravel at 39'; wet	
40					Dary gray CLAY (CL); glacial till; trace gravel and coarse sand; moist	
45	10	6.5	65			
50						
55	10	7.5	75			
60						
	10	4.5	45		Gray LIMESTONE (bedrock); highly weathered; ground up during drilling to gravel size chunks; wet	
65						

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:28 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of SB-5
Sheet 3 of 3

MON 867

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
	10	4.5	45				
70							End of boring
75							
80							
85							
90							
95							
100							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTEMONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:29 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of SB-6

Sheet 1 of 3

MON 868

Date(s) Drilled	**9/22/16 to 9/22/2016**	Logged By	**Ron Friend**	Checked By	**M Hawrylak**
Drilling Method	**Sonic**	Drill Bit Size/Type	**Sonic 6"**	Total Depth of Borehole	**80.0 ft**
Drill Rig Type	**Mini Sonic**	Drilling Contractor	**Cascade Drilling**	Surface Elevation	**ft msl**
Borehole Backfill	**Monitoring Well**	Sampling Method(s)	**Sonic Core Barrel - 4"**	Top of Casing Elevation	**ft msl**
Boring Location	**Inactive Bottom Ash Basin**	Groundwater Level(s)	**N/A**		

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Well Diagram	REMARKS AND OTHER DETAILS
0					Gray Gravel (FILL-berm materials); loose; little sand and silt; wet @ 3 feet		
5	10	4.0	40				
10					Dark gray CLAY (CH); soft; with some ash; high plasticity; moist-wet; some fill material		
15	10	8.25	82.5				
20							
25	10	7.5	75				
30					Dark gray CLAY (CH); hard; med-high plasticity; trace coarse sand and gravel; moist		

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:36 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of SB-6
Sheet 2 of 3

MON 868

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
30							
35	10	10	100				
40					Dark gray CLAY (CL); hard; low plasticity; trace coarse sand and gravel; moist		
45	10	8.5	85				
50							
55	5	4.5	90				
60	5	5.5	110				
65	10	6.0	60		Light gray LIMESTONE (bedrock); highly weathered; some intact pieces 1"-3" long; moist to dry		

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:37 PM

AECOM

MON-PP-0068-16

Project: DTE Monroe Plant
Project Location: Monroe, Michigan
Project Number: 60489524

Log of SB-6
Sheet 3 of 3

MON 868

Depth, feet	SAMPLES: Run Length (ft)	SAMPLES: Recovery (ft)	SAMPLES: Recovery, %	Graphic Log	MATERIAL DESCRIPTION		REMARKS AND OTHER DETAILS
	10	6.0	60		Gray LIMESTONE (bedrock); some weathering; staining on fractures; some intact pieces 2"-3" long; wet		
70							
					Gray LIMESTONE (bedrock); highly weathered; wet		
75	10	7.0	70		Gray LIMESTONE (bedrock); some weathering; staining on fractures; some intact pieces 2"-3" long; wet		
80							End of boring
85							
90							
95							
100							

Report: DTE_MONROE; File J:\RESOURCE\DISCIPLINES\ENVGINT\PROJECTS\DTE\MONROE _GRANVILLE CLONE.GPJ; 3/24/2017 3:26:38 PM

AECOM

Appendix B
Cross Sections

Document Path: G:\Cincinnati\DCS\GIS\ArcMap_GeoDB_Projects\D\DTE\DTE-Monroe Plant\Data-Tech\GIS\DTE_Monroe_Fig2_Cross-Section_Location_Map.mxd

Discharge Canal

E
264
265
266
800
MW-5S
267
752
736
737
443
C
738
739
SB-3
740
444
741
742
743
744
745
746
MW-14
MW-4S
445
C'
755
764
761
459
Conveyance Lines to Fly Ash Basin
MW-15
MW-7S
MW-7D
MW-9
MW-8S
MW-8D
D
454
MW-10
Separation Berm
E'
455
SB-6
759
456
MW-13
457
D'
MW-1D
MW-1S
MW-3S
MW-3D
MW-11
MW-2S
MW-12
Lake Erie

Aerial and Google Earth 2016 Aerial Imagery

LEGEND:

- CCR Program Monitoring Well
- Investigation Monitoring Well (Potentiometry Only)

Soil Borings (NTH)

- Soil Boring pre-1971
- Soil Boring 1971 and later
- Soil Boring 1971 and later with ash fill
- Soil Boring in 2015 by NTH with ash fill

- Unit Separation Berm
- Cross Section Location
- Conveyance Line Boring Corridor (No Basal Sand)
- Approximate Plant Boundary
- Approximate Boundary of Inactive Bottom Ash Basin

N

0 700 1,400 Feet

DTE Energy

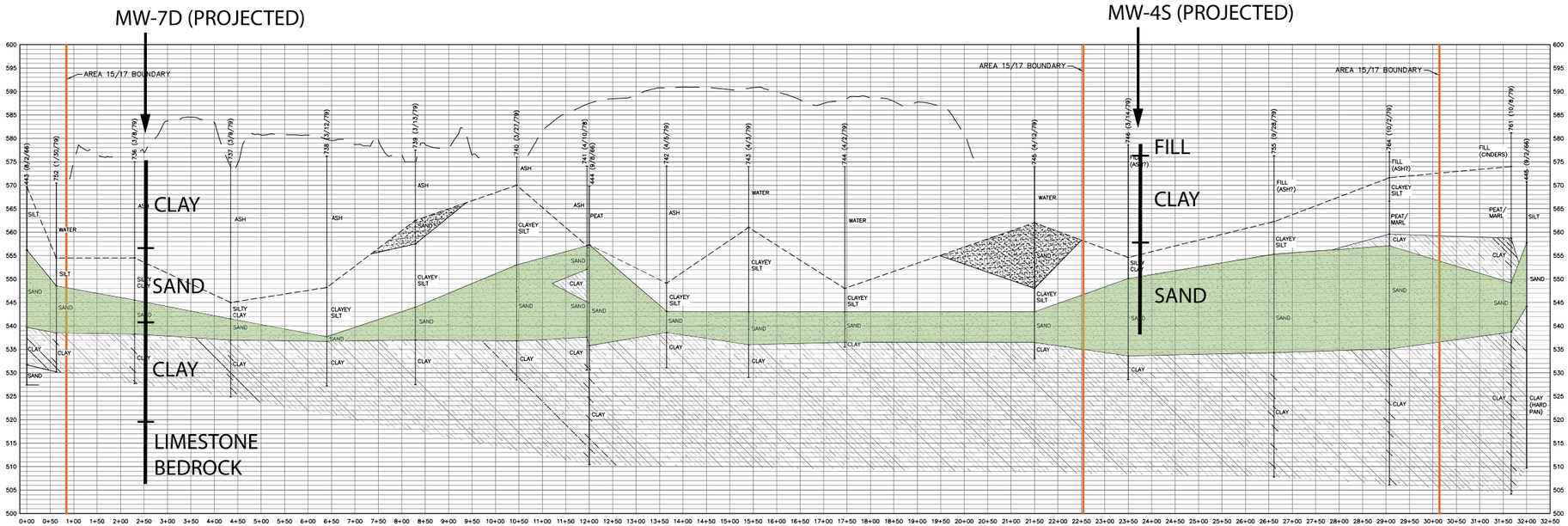
Monroe Power Plant

FIGURE 2
GEOLOGIC CROSS-SECTION LOCATION MAP

DATE: 3/21/2019	SCALE 1 inch = 700 feet
JOB NO. 60516675	

NORTHWEST **SOUTHEAST**

C



C'

LEGEND

ASH
CLAY
SAND
UPPERMOST AQUIFER

PRELIMINARY
NOT FOR CONSTRUCTION

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1-800-482-7171
For the location of public utility lines.
ALTERNATE NUMBER (810) MISS-DIG
COLOR CODES FOR UTILITY LOCATING:
White — EXC. M. ORC
Orange — TEMP. SURVEY
Red — ELECTRIC
Blue — WATER
Green — STORM DRAIN
Brown — SEWER
Pink — SURVEYING
IF YOU ARE GOING TO WORK NEAR OVERHEAD WIRES ... CALL MISS DIG

THIS IS A CAD PRODUCED DRAWING. ANY CHANGES OR REVISIONS TO THIS DRAWING MUST BE COMPLETED USING THE CAD SYSTEM.

C	PROJ.ENG.	PROJ.MGR.
	MADE BY / DATE / I&C / ELECT.	
	CHK. BY / DATE / MECH. / APPROVED BY	

B	PROJ.ENG.	PROJ.MGR.
	MADE BY / DATE / I&C / ELECT.	
	CHK. BY / DATE / MECH. / APPROVED BY	

A	PROJ.ENG.	PROJ.MGR.
	MADE BY / DATE / I&C / ELECT.	
	CHK. BY / DATE / MECH. / APPROVED BY	

DETROIT EDISON APPROVALS	DATE
FOS GEN TECH ORG	
FOS GEN PLANT ENG	
DIST OPR	
PROJECT ENG	
ENG COMP	

OTHER DISCIPLINE APPROVALS	DATE
ARCH	
CIVIL	
MECH	
ELEC	
I&C	

DESIGNED BY	DATE
ACE	7/13/2015
DRAWN BY	DATE
CWS	7/13/2015
CHECKED BY	DATE
DRL	7/13/2015
APPROVED BY	DATE
PROJECT ENGINEER	DATE
PROJECT MANAGER	DATE

2

LATEST REVISION "0"

PMP NUMBER: 11107
GL/WBS2 NUMBER: I-000022-0211
PO NUMBER: 4700855696

NO.	DATE	ISSUED FOR	PROJ ENG	RESP ENG
6				
5				
4				
3				
2				
1				

PROJECT ENGINEER: APPROVALS
PRECONSTRUCTION REVISION BLOCK – REV.

Vendor:

NTH Consultants, Ltd.
Infrastructure Engineering & Environmental Services
Northville, Michigan

NTH PROJECT NO. 62-150239-00

The Detroit Edison Co. Engineering

TITLE

AREA 15-17 CLOSURE
CROSS SECTIONS A,B,C

LOCATION NAME	UNIT NUMBER
MONROE POWER PLANT	1-6
ORIGINATING SOURCE: NTH CONSULTANTS, LTD.	SCALE: AS SHOWN / USE DIMENSIONS ONLY, DO NOT SCALE

DRAWING NUMBER 2

DESIGN FILE:
DATE ISSUED:
DATE PLOTTED:
OPERATOR:

DTE Energy

Monroe Power Plant

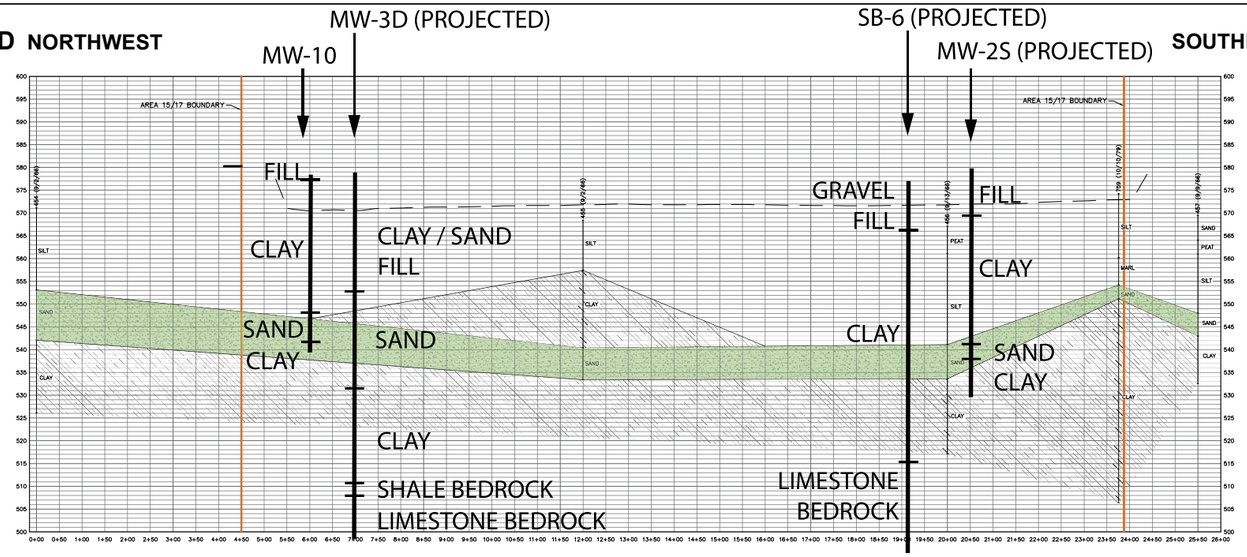
FIGURE 2a
NTH CONSULTANTS, LTD - GEOLOGIC CROSS-SECTION C - C'

DATE	REV NO.	DWG. BY	CHKD. BY
03/20/19	1	JMA	WBL

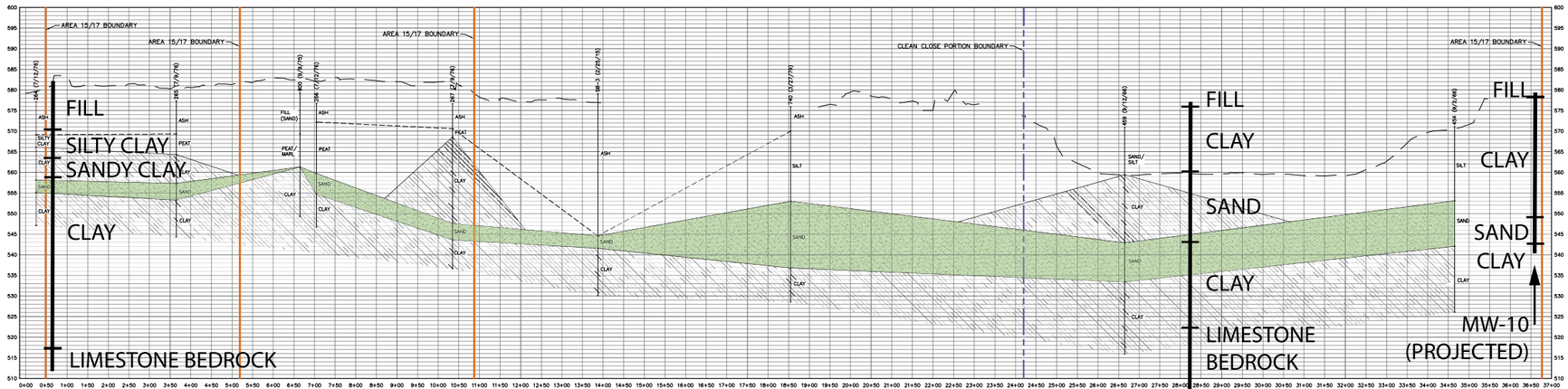
JOB NO. 60516675 AECOM

J:\Project\D\DTE\DTE-Monroe Plant\Deliverables\Draft\Aquifer Memo\Fig2a_Geo-Xsection_CC.AI

D NORTHWEST — **SOUTHEAST D'**



NORTHEAST E — **E' SOUTHWEST**



LEGEND

ASH
CLAY
SAND
UPPERMOST AQUIFER

PRELIMINARY
NOT FOR CONSTRUCTION

THIS IS A CAD PRODUCED DRAWING. ANY CHANGES OR REVISIONS TO THIS DRAWING MUST BE COMPLETED USING THE CAD SYSTEM.

3

LATEST REVISION "0"

PMP NUMBER: 11107
GL/WBS2 NUMBER: I-000022-0211
PO NUMBER: 4700855696

NO.	DATE	ISSUED FOR	PROJ ENG	RESP ENG
6				
5				
4				
3				
2				
1				

PROJECT ENGINEER: APPROVALS
PRECONSTRUCTION REVISION BLOCK – REV.

Vendor:

NTH Consultants, Ltd.
Infrastructure Engineering & Environmental Services

NTH PROJECT NO. 60-150239-09

The Detroit Edison Co. — Engineering

TITLE
AREA 15-17 CLOSURE
CROSS SECTIONS D,E

LOCATION NAME: MONROE POWER PLANT
UNIT NUMBER: 1-4
DRAWING SOURCE: NTH CONSULTANTS, LTD.
SCALE: AS SHOWN
USE DIMENSIONS DO NOT SCALE
DRAWING NUMBER: 3

	DESIGNED BY	DATE
ACC		7/13/2015
DRAWN BY		DATE
CWS		7/13/2015
CHECKED BY		DATE
CAL		7/13/2015
APPROVED BY		DATE
PROJECT ENGINEER		DATE
PROJECT MANAGER		DATE

DESIGN FILE:
DATE ISSUED:
DATE PLOTTED:
OPERATOR:

DTE Energy — *Monroe Power Plant*

FIGURE 2b
NTH CONSULTANTS, LTD
GEOLOGIC CROSS-SECTIONS D - D' AND E - E'

DATE	REV NO.	DWG. BY	CHKD. BY
03/20/19	1	JMA	WBL

JOB NO. 60489524 — AECOM

J:\Project\D\DTE\DTE-Monroe Plant\Deliverables\Draft\Aquifer Memo\Fig2b_Geo-XsectionS_DD_EE.AI

Appendix C
National Wetland Inventory Map

Wetlands Map Viewer

March 9, 2020

Part 303 Final Wetlands Inventory

- Wetlands as identified on NWI and MIRIS maps
- Soil areas which include wetland soils
- Wetlands as identified on NWI and MIRIS maps and soil areas which include wetland soils
- Gage Stations
- National Wetlands Inventory 2005

1:19,329

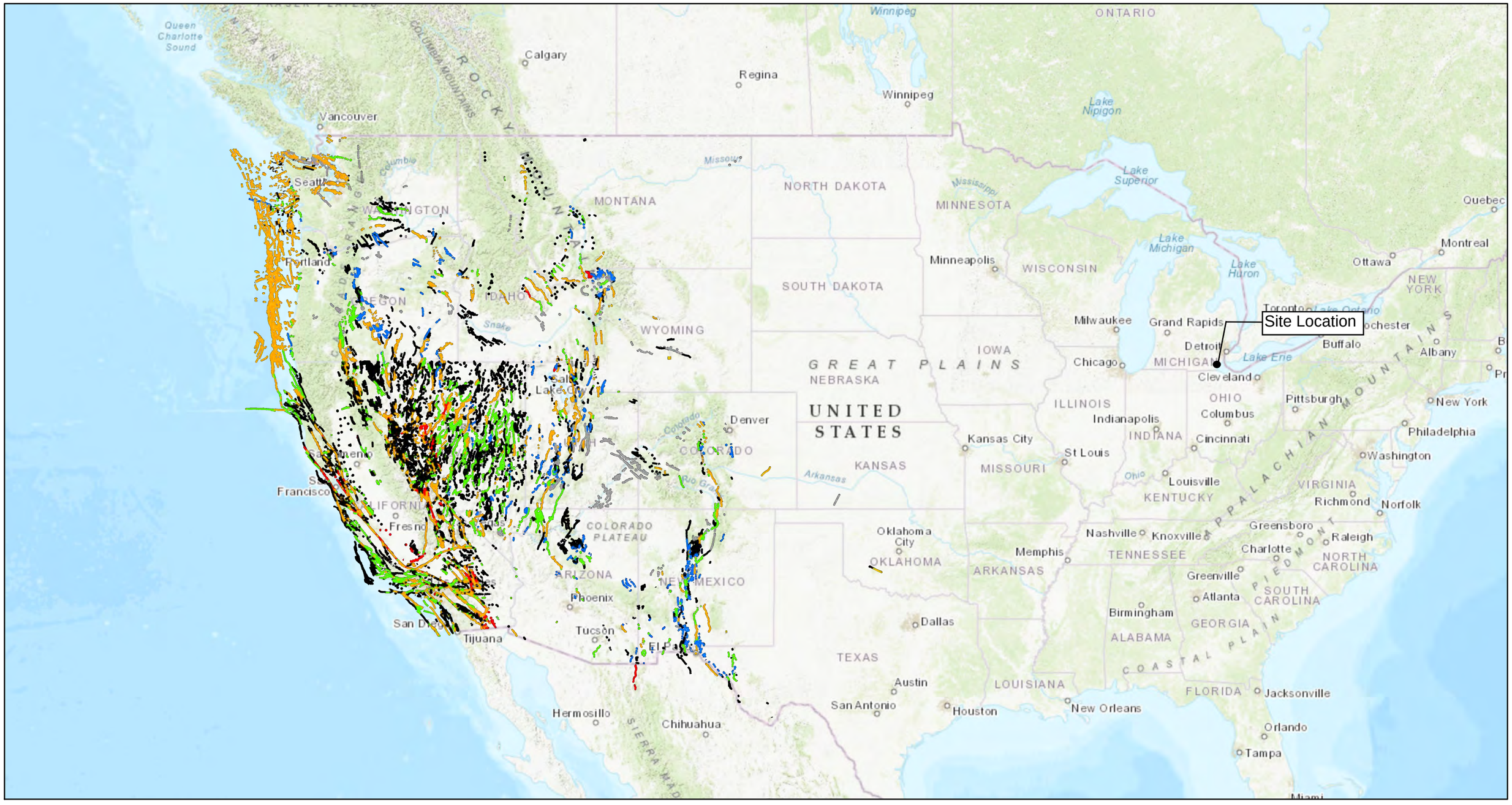
0 0.15 0.3 0.6 mi

0 0.25 0.5 1 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,

Appendix D
U.S. Quaternary Faults and Folds Map

US Quaternary Faults and Folds



9/7/2018, 3:20:39 PM

1:18,489,298

Quaternary faults

- unspecified age, well constrained location
- unspecified age, moderately constrained location
- unspecified age, inferred location
- undifferentiated Quaternary (< 130,000 years), well constrained location
- undifferentiated Quaternary (< 130,000 years), moderately constrained location
- undifferentiated Quaternary (< 130,000 years), inferred location
- middle and late Quaternary (< 1.6 million years), well constrained location
- middle and late Quaternary (< 1.6 million years), moderately constrained location
- middle and late Quaternary (< 1.6 million years), inferred location
- latest Quaternary (<15,000 years), well constrained location
- latest Quaternary (<15,000 years), moderately constrained location
- latest Quaternary (<15,000 years), inferred location
- late Quaternary (< 130,000 years), well constrained location

0 175 350 700 mi

0 275 550 1,100 km

Web AppBuilder for ArcGIS
USGS | Esri, FAO, NOAA |

Appendix E
Seismic Design Curves

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (upd

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

41.872

Time Horizon

Return period in years

2475

Longitude

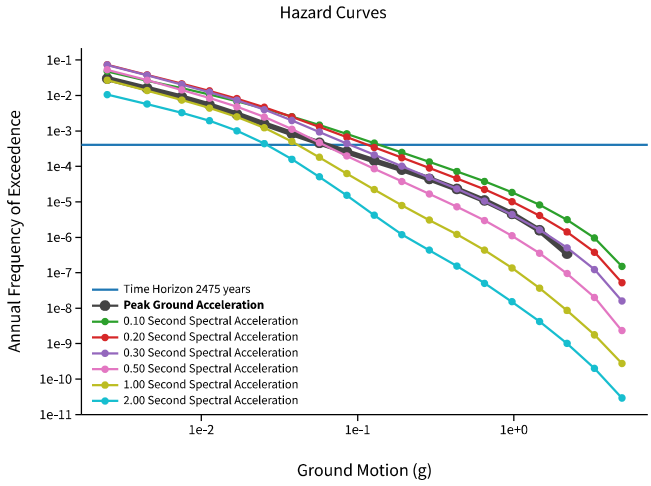
Decimal degrees, negative values for western longitudes

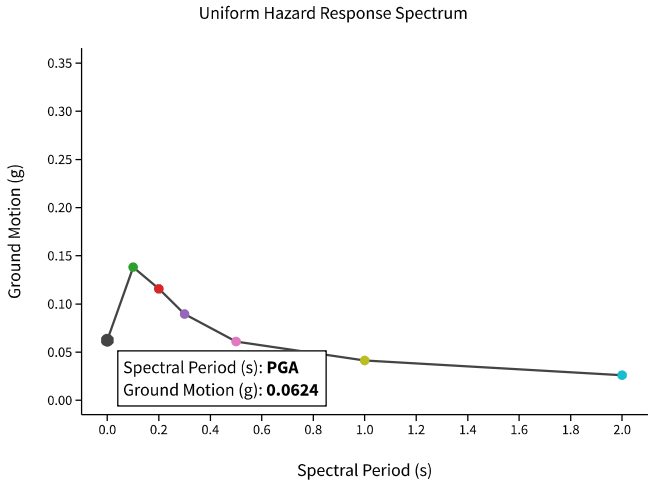
-83.345

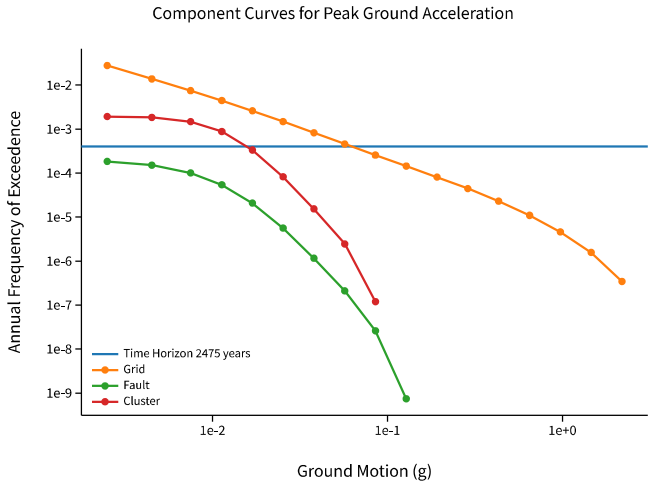
Site Class

760 m/s (B/C boundary)

Hazard Curve







View Raw Data