

#### **Location Restrictions Demonstrations**

DTE Electric Company
Range Road Coal Combustion Residual Landfill

3600 Range Road China Township, Michigan

October 2018



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Prepared For DTE Electric Company

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David B. McKenzie, P.E. Senior Project Engineer

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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

David B McKenzie, P.E.

License No: 6201042332

## Section 1 Background

The purpose of this document is to determine whether the Coal Combustion Residual (CCR) landfill at the Range Road Landfill (RRLF) is in compliance with the location restrictions outlined in the Environmental Protection Agency's (EPA) final CCR rule [Title 40 Code of Federal Regulations (CFR) 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 RRLF is considered an existing CCR landfill according to the federal rule (§257.53).

This document includes information from a desktop study and well installation activities to demonstrate that the landfill is in compliance with locational criteria as defined in §257.60 through §257.64 of the federal rule.

Supporting documents are provided in appendices to this demonstration.

#### 1.1 Facility and CCR Unit Information

The RRLF is located in Section 12, Township 4 North, Range 16 East, 3600 Range Road, China Township in St. Clair County, Michigan. The site is located approximately one-half mile west of the St. Clair River and one mile north of the Belle River Power Plant. The RRLF property was previously used as farmland prior to being used continuously as a coal ash landfill since Detroit Edison Company (now DTE Electric) began coal ash landfilling operations at the RRLF in the 1950s. The RRLF is constructed over a natural confining, low permeability clay-rich soil base that serves as an underlying soil barrier. The RRLF property consists of approximately 514 acres of which 402 acres are designated for landfill development. CCR currently occupies approximately 200 acres of the RRLF, and the landfill is estimated to have several decades of capacity remaining.

The RRLF is licensed and operated as a Type III solid waste disposal facility in accordance with Michigan's Part 115 solid waste regulations [Michigan Part 115 of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended]. Under current operating license number 9395, the disposal facility currently accepts coal ash from DTE Electric's St. Clair and Belle River power plants and has historically accepted coal ash from the former DTE Electric Harbor Beach and Marysville power plants.

#### 1.2 Site Setting

The RRLF CCR unit is located approximately one-half mile west of the St. Clair River. Soil and Materials Engineers, Inc., advanced 66 soil borings at the RRLF in 1995 as part of a geotechnical

subsurface investigation (SME, 1996), and as part of the installation of the CCR groundwater monitoring network nine deep soil borings/wells were advanced in 2016 (TRC, October 2017); representative soil boring logs are included in Appendix A. In general, the RRLF is initially underlain by 86 feet to as much as 188 feet of laterally extensive low hydraulic conductivity silty clay-rich deposits, although on the eastern portion and northwest corner of RRLF some thin partially saturated silty sand near-surface deposits are present. These deposits are not laterally contiguous, are not in communication with the deeper uppermost aquifer, do not yield a useable quantity of groundwater, and thus are not considered an aquifer per the CCR Rule. On a significant portion of the RRLF, there is a bedrock valley that trends from the northeast corner to the south-central area of the site. The valley is incised in the Bedford and/or Antrim Shale bedrock and filled with unconsolidated glacial deposits consisting of clay, silt, sand and/or gravel. Based on historical oil well logs from the RRLF area, the bedrock valley extends to depths of up to 303 feet below ground surface (ft bgs). Along the western portion of the RRLF, clay-rich till is present continuously to the top of the underlying Bedford or Antrim Shale bedrock in the area of SB-16-01 and SB-16-02 (Figure 1), creating a no flow boundary.

Groundwater within the uppermost aquifer sand/gravel is confined and protected from CCR constituents by the overlying clay-rich aquitard. The top of the sand/gravel uppermost aquifer encountered at each of the CCR monitoring wells and soil borings is at significantly different elevations across the RRLF that, where present, is first encountered at depths ranging from 86 to 196 ft bgs, immediately beneath the overlying clay-rich aquitard. The variability in boring/well depths is a consequence of the heterogeneity of the glacial deposits and is driven by the limited continuity of the coarse-grained sand and gravel outwash within the overlying/encapsulating fine-grained, silty clay till that confines the uppermost aquifer. In addition, there is an apparent lack of interconnection and/or significant vertical variation between the various uppermost aquifer sand and/or gravel units encountered across the RRLF CCR unit.

Given the horizontally expansive clay with substantial vertical thickness, the heterogeneity of the glacial deposits (with the top of the uppermost aquifer elevation across the RRLF CCR unit varying up to 100 feet vertically), the no-flow boundary to the west, and the lack of hydraulic interconnectedness of the uppermost aquifers encountered at the site in some areas, it is not appropriate to infer horizontal flow direction or gradients across the site. In addition, the elevation of leachate beneath the CCR within the RRLF and surface water managed in the perimeter ditch network is approximately 10 to 20 feet above the potentiometric surface elevations in the uppermost aquifer. This shows that if the leachate and/or potentially CCR affected groundwater were able to penetrate the clay-rich underlying confining till, that it would travel radially away from the RRLF. However, with the presence of the vertically and horizontally extensive clay-rich confining till beneath the RRLF CCR unit, it is not possible for the uppermost aquifer to have been affected by CCR from operations that began in the 1950s.

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## Section 2 Location Restrictions

The location restrictions designated in the federal CCR rule are presented below with a corresponding demonstration to show compliance with each restriction. The location restrictions include placement above the uppermost aquifer, within wetlands, near fault areas, within seismic impact zones, and in unstable areas based on geologic and geomorphologic information. Supporting information for the demonstrations is included in the appendices to this report.

#### 2.1 §257.60 – Placement above the Uppermost Aquifer

Per §257.60(a), the requirements of §257.60 apply to new or existing surface impoundments, new landfills, and all lateral expansions of CCR units. The RRLF is classified as an existing landfill according to the federal rule; therefore, the requirements of §257.60 do not apply to the RRLF.

#### 2.2 §257.61 – Wetlands

Per §257.61(a), the requirements of §257.61 apply to new or existing surface impoundments, new landfills, and all lateral expansions of CCR units. The RRLF is classified as an existing landfill according to the federal rule; therefore, the requirements of §257.61 do not apply.

#### 2.3 §257.62 – Fault areas

Per §257.61(a), the requirements of §257.62 apply to new or existing surface impoundments, new landfills, and all lateral expansions of CCR units. The RRLF is classified as an existing landfill according to the federal rule; therefore, the requirements of §257.62 do not apply.

#### 2.4 §257.63 – Seismic Impact Zones

Per §257.61(a), the requirements of §257.63 apply to new or existing surface impoundments, new landfills, and all lateral expansions of CCR units. The RRLF is classified as an existing landfill according to the federal rule; therefore, the requirements of §257.63 do not apply to the RRLF.

#### 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 reviewing geotechnical data, local geology, topography, and evaluating human-made features at the RRLF.

As described in Section 1.2 of this report, the RRLF is generally underlain by a hard to soft low permeability clay. This clay is noted to be medium stiff to hard nearer the surface (top 10 to 15 feet) and softens with depth as the moisture content increases. The clay soils overlie the silty sand to gravel aquifer which overtops the hard shale bedrock. Topography in the vicinity of the site is generally flat with no areas of significant elevation change. These observations suggest that there are no unstable soil or bedrock or unstable side slope conditions proximal to the RRLF that could impact the ongoing operations at the RRLF. Additionally, periodic facility inspections are performed to assess the ongoing condition of constructed landfill berms, caps, and drainage features.

Evidence of unstable areas due to soil conditions resulting in significant differential settling, geologic or geomorphologic features, or human-made features or events is not supported by this determination; therefore, the RRLF is not located in an unstable area. The landfill is in compliance with the requirements of §257.64.

## Section 3 Conclusions

Based on the evaluation provided in this demonstration, the RRLF are in compliance with the location restrictions provided in §257.60 through §257.64 of the CCR rule. No additional action, justification, or demonstration is required to document compliance with the location restrictions provided in the CCR rule after this demonstration has been placed into the operating record, posted to the publicly-accessible website, and government notifications provided.

### Section 4 References

- Soil and Materials Engineers, Inc. (SME) 1996. Geotechnical Investigation—Verification of Natural Soil Barrier Range Road Fly Ash Landfill Site.
- TRC. October 2017. Groundwater Monitoring System Summary Report DTE Electric Company Range Road Coal Combustion Residual Landfill.
- TRC. January 2018. Annual Groundwater Monitoring Report DTE Electric Company Range Road Coal Combustion Residual Landfill.

# Appendix A Soil Boring Logs

Facilit	y/Projec	ct Name	9;			Sh Latin	Date Drilling Started	l: Da	ate Drilling	Comple	ted:		1 of 4 ct Number:
		OTE E	Electr	ic Compar		Road Landfill	1/5/16			3/16		231	828.0000.000
Drilling	g Firm:				Drilling Me	ethod:	Surface Elev. (ft)	TOC Elev	1000	Total	Depth	(ft bgs)	Borehole Dia. (in)
		tock				Sonic	592.70	595	5.35		220.		6
Boring	) Locati	on: 15	7' NW	of water filling	station, 10'	SW of main drive.	Personnel Logged By - C. Sci Driller - A. Goldsmi			Drilling	g Equi	pment: TSi 1	150cc
	own/Ci			County:	01.	State:	Water Level Observ While Drilling:	Date/Tir		en Chil			th (ft bgs)
SAN	East (	China		St.	Clair	MI	After Drilling:	Date/Tir	ne <u>2/3/1</u>	6 16:16	4	L Dept	th (ft bgs) 12.94
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET			LITHOLOG DESCRIPT			SOSO	GRAPHIC LOG	WELL DIAGRAM	C	COMMENTS
						ostly fine to medium 3), moist, dense, roo	sand, some silt, dan	rk	SM	雅			uous sampling with
1 CS	50		5-	SILTY (	CLAY mo	stly clay, some silt,	low to medium plast	ticity, rown	CL- ML			ground soil bo 6-inch	diameter casing from d surface to terminus c rring, over-drilled with diameter casing to monitoring well.
2 CS	75		10-	(10YR stiff.	5/1) mottl	ay, trace silt, mediui ed with yellowish br medium to coarse s	m to high plasticity, g own (10YR 5/6), dry sand at 10.5 feet.	gray , very					
.5			20-	Change 15.5 fe		plasticity, gray (10Y	R 5/1), moist, very s	oft at					
3 CS	90		25-						CL				
4 CS	50		30 -	Change	e to no sa	and at 30.0 feet.							
			40-										

Firm:

TRC Environmental Corporation 1540 Eisenhower Place Ann Arbor, Michigan 734.971.7080 Fax 734.971.9022

Checked By: M. Powers

SAM	_		70					MW-16-01 age 2 of 4
S NUMBER AND TYPE	g RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION  CLAY mostly clay, trace silt, high plasticity, gray (10YR 5/1),	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
6 ST	100		50-	moist, very soft.				
7 CS	80		55-					
			60					
8 CS	60		65 —					
			70-					
9 CS	100		75-	Change to trace coarse gravel, trace coarse sand, soft at 75.0 feet.	CL			
			80-					
10 CS	100		85 — -	Change to trace fine to coarse gravel, trace coarse sand, medium stiff at 85.0 feet.				
			90-	Change to stiff at 90.0 feet.				
11 CS	70		95-					
			100-					

SAM	IPLE		RO	ز	W	ELL	NO.	MW-16-01 Page 3 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	100		110— 110— 115— 125— 135— 140—	CLAY mostly clay, trace coarse gravel, trace coarse sand, trace silt, high plasticity, gray (10YR 5/1), moist, stiff.  Change to few fine to coarse sand, trace fine to coarse gravel at 140.0 feet.	CL			4-inch sample rods sank under weight of casing due soft clay from 130 feet to 14 feet when cased off to 130 feet with 6-inch casing rods.
15 CS	100		145	SILT mostly silt, non-plastic, dark gray (10YR 4/1), moist, medium stiff to stiff.	ML			
16 CS	100		150-	SAND mostly fine sand, trace silt, dark gray (10YR 4/1), moist, medium dense to dense.  CLAY mostly clay, trace fine to coarse gravel, trace fine to coarse sand, low plasticity, dark gray (10YR 4/1), dry, hard.	SP			
17 CS	100		155—		CL			
			160 —	Change to few fine to coarse gravel at 160.0 feet.				

	WELL CONSTRUCTION LOG WELL NO											
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS				
18 CS	100	8	165 —	CLAY mostly clay, few fine to coarse gravel, trace fine to coarse sand, low plasticity, dark gray (10YR 4/1), dry, hard.	2		>					
			170-									
19 CS	100		175—		CL							
20 CS	100		180-									
21 CS	50		185	CLAY WITH SAND AND GRAVEL mostly clay, few to little fine to coarse gravel, few to little fine to coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.	CL	10/0/0						
			190	SAND WITH GRAVEL mostly fine to coarse sand, little fine to coarse gravel, few silt, dark grayish brown (10YR 4/2), moist to saturated, loose.  CLAY WITH SAND AND GRAVEL mostly clay, few to little	SW	1						
22 CS	100		195—	fine to coarse gravel, few to little fine to coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.  SILTY SAND mostly fine to coarse sand, little to some silt, trace to few fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, loose.  Change to trace cobbles at 200.0 feet.	SM							
23 CS	80		205-	SAND WITH SILT mostly fine to coarse sand, few to little silt, trace to few fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, loose.	SW- SM							
77			210-	SILTY SAND mostly fine to medium sand, some silt, trace to few fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, loose.	SM		E E E					
24 CS	90		215—	CLAY mostly clay, trace fine to coarse sand, trace to few fine to coarse gravel, trace cobbles, low plasticity, dark grayish brown (10YR 4/2), dry to moist, hard.	CL							
			220	End of boring at 220.0 feet below ground surface.		//	4					

racilit		+ NIa					I net	Drilling Start-	4.	Data F	rilling 4	Complet	ort:	_	1 of 4 ct Number:
	y/Projec			. 0	an Australia	Deed Leaden	Date	Drilling Starte	4,6	Date			cu.	12.79	
Daillia	g Firm:	HEE	lectri	c Compa	Drilling Me	Road Landfill	Cur	1/14/16 face Elev. (ft)	TOC	Elevatio		0/16	Donth :	(ft bgs)	828.0000.0000 Borehole Dia. (in)
Drilling			S.:111:		Drilling ivie		Sui			598.44			220.0		The second second second second
Porinc			Orilling		M of drive S o	Sonic f Range Rd. gate.	Por	595.33 sonnel		390.44	•	Drilling		411	6
				36-07, 10	vv or anve, 3 o	ritarige itd. gate.	Lo	gged By - C. So iller - A. Goldsm				Diming	, cqui		150cc
Civil T	Town/Cit	y/or Vil	age:	County:		State:		ter Level Obser hile Drilling:		e/Time				Den	oth (ft bgs)
_	East (	China		S	t. Clair	MI		er Drilling:			2/8/1	6 13:24	7		oth (ft bgs)17.53
SAN	IPLE												111		
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET			LITHOLO DESCRIF					nscs	GRAPHIC LOG	WELL DIAGRAM	(	COMMENTS
1			4 00 100	CLAY silt, tra	EY SAND ace fine to	mostly fine to me coarse gravel, bro	dium sand own (10YF	, some clay R 4/3), mois	, few t, dens	se.	SC			4-inch groun soil be 6-inch	nuous sampling with n diameter casing from id surface to terminus o oring, over-drilled with n diameter casing to I monitoring well.
cs	60		5-			H SAND mostly and, low plasticity				ery	CL- ML			due to boring feet b	nal soil boring abandone to broken rods lost in g at approximately 210 selow ground surface. lled and installed well a
			10-	SAND (10YF	7 5/6), mois	e to medium san t, loose. gray (10YR 4/1) a			rown		SP			surve litholo taken appro	y location noted above, ygy from 0 to 160 feet from original boring oximately 20 feet south 16-02.
2 CS	60		15-	CLAY gray ( ▼	mostly cla (10YR 4/1),	y, trace coarse s dry to moist, hard	and, high d.	plasticity, d	ark						
			20 -	Chan feet.	ge to trace	fine gravel, no sa	and, moist	very soft a	t 20.0						
3 CS	80		25-												
			30-	Chan	ge to no gr	avel at 30.0 feet.					CL				
4 CS	100		35-												
			40-	1-incl grave	h thick sand el, very dark	d seam, mostly fir gray (10YR 3/1)	ne to coars , saturated	se sand, tra d, loose at 3	ce coa 19.5 fe	arse et.					

Signature Accessor

Firm: TRC Environmental Corporation 1540 Eisenhower Place Ann Arbor, Michigan

		MW-16-02 age 2 of 4						
SAM	PLE							
AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
I				CLAY mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.				
6 T	100		50-		E			
7 :S	100		55-					
			60-					
М			1		114			
B S	100		65-					
1			70-		CL			
e S	90		75-					
ı			80-	Change to trace fine gravel, trace fine to coarse sand, medium plastic, medium stiff at 78.5 feet.				
0	80		85—					
ı			90-	SILT mostly silt, trace clay, trace to few fine sand, non-plastic,	ML			
			1	dark gray (10YR 4/1), dry, hard.  SILTY SAND mostly fine sand, few medium sand, little to some silt, dark grayish brown (10YR 4/2), moist, dense.	1	摊		
1 :S	90		95-	some siit, dark grayish blown (1011( 4/2), moist, dense.	SM			
1 1 S			100-	CLAY mostly clay, trace to few fine to coarse sand, trace fine to coarse gravel, trace silt, medium to high plasticity, dark gray (10YR 4/1), moist, stiff.				
			105-		CL			

	2	T	RO	WELL CONSTRUCTION LOG	w	ELL	NO.	MW-16-02 Page 3 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
S S	40	8	110- 	CLAY mostly clay, trace to few fine to coarse sand, trace fine to coarse gravel, trace silt, medium to high plasticity, dark gray (10YR 4/1), moist, soft.	CL	S	M	4-inch sample rods sank under weight of casing due soft clay from 110 feet to 11 feet when cased off to 110 feet with 6-inch casing rods.
13 2S	100		120-	SILT mostly silt, few fine sand, non plastic, dark gray (10YR 4/1), moist, medium stiff.	ML			118 to 120 feet sample likel fell out of rods during retriev
CS			130-	SILTY SAND mostly fine sand, little silt, trace cobbles, trace fine to coarse gravel, dark gray (10YR 4/1), saturated, dense.	SM			
15	100		135	CLAY mostly clay, trace to few fine to coarse gravel, trace coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.				
16	70		140-				VA	
1			150-		CL			
7 S	80		155—		5			
			160					
18 2S	100		165-					
			170-					

	C		R	WELL CONSTRUCTION LOG	w	ELL		<b>MW-16-02</b> Page 4 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
19 CS	100		175—	CLAY mostly clay, trace to few fine to coarse gravel, trace coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.	CL			
20 CS	60		185-	SAND WITH SILT mostly fine to coarse sand, few to little silt, dark grayish brown (10YR 4/2), saturated, medium dense.  CLAY mostly clay, trace to few fine to coarse gravel, trace coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.	SW- SM			
21 CS	100		190	SILTY SAND WITH GRAVEL mostly fine to coarse sand, some silt, little fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, dense.  SILTY SAND mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.	SM	0 0 0 0		
22 CS	100		200 -	SAND mostly fine to coarse sand, trace to few silt, dark grayish brown (10YR 4/2), saturated, loose.  SILTY SAND mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.  SAND mostly fine to coarse sand, trace to few silt, dark grayish brown (10YR 4/2), saturated, loose.  SILTY SAND WITH GRAVEL mostly fine sand, some silt, little fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, dense.	SW SM SW SM	61 F 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		
23 CS	100		210-	SILTY SAND mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.  SILT WITH GRAVEL AND SAND mostly silt, few to little fine to coarse gravel, few to little fine to coarse sand, non-plastic, dark gray (10YR 4/1), saturated, hard.  GRAVEL WITH SILT AND SAND mostly fine to coarse in gravel, few to little fine to coarse sand, few to little silt, dark gray (10YR 4/1), saturated, loose.  SAND WITH GRAVEL mostly fine to coarse sand, little fine to	ML GW- GM SW			
			220 -	coarse gravel, trace to few silt, dark gray (10YR 4/1), saturated, loose.  SAND mostly medium to coarse sand, trace to few silt, trace fine to coarse gravel, dark gray (10YR 4/1), saturated, loose.  Change to mostly fine sand, no gravel, dark grayish brown (10YR 4/2) at 217.0 feet.  Change to mostly medium to coarse sand, few to little fine to coarse gravel, dark gray (10YR 4/1) at 218 feet.  End of boring at 220.0 feet below ground surface.			0	

DTE Electric Company Range Road Landfill    1/28/16	Facilit	y/Projec	t Name	5.				Date Drilling Starte	d: 1	Date D	rilling (	Complet	ed:	Page 1	1 of 4 ct Number:	-
Drilling Firms   Drilling Method:   Sonic	-				c Company	y Range I	Road Landfill		-		-	70.0		1		.00
Stock Drilling ving Location: 32' W of Elence, 420' N of PZ-2, N of Range Rd, gate.  Logged By - C. Scieszka brilling Date/Time Logged By - C. Scieszka Drilling Date/Time Date/Date/Date/Date/Date/Date/Date/Date/	Orilling				pail		LENGTH ON THE STORY OF STREET	3572767632		Elevation	1752 1 5	100-016	epth)	THE PERSON	Borehole Di	100
Drilling Equipment.  TSi 150cc  ITSi 150cc	1		tock I	Orillin	g			595.07	110000		3000	10000	98.20	10000	6/4	
TSi 150cc    Drifer - A Goldsmith   TSi 150cc	Boring					of PZ-2, N		Personnel					F 15-15-2010	1700		
Water Level Observations:  East China  St. Clair  MI  Water Drilling: DaterTime After Drilling: DaterTime DaterTime After Drilling: DaterTime DaterTime After Drilling: DaterTime DaterTim														TSi 4	5000	
East China  St. Clair  MI  After Drilling: Date/Time Dat	ivil T	own/Cit	y/or Vil	lage:	County:		State:		0.1518.3					101	. 5566	
CLAY mostly clay, high plasticity, brown (10YR 4/3) mottled with yellowish brown (10YR 5/6) and gray (10YR 6/1), dry to moist, very stiff.  SANDY CLAY mostly clay, some fine to coarse sand, very dark brown (10YR 2/2), dry to moist, soft, trace coarse sand sized coal fragments, trace fine gravel sized slag fragments.  CLAY WITH SAND mostly clay, little fine to medium sand, trace to faw fine to coarse gravel, low to medium plasticity, dark gray (10YR 4/1), moist, medium stiff.  SAND mostly fine to medium sand, trace is gravel sized slag fragments.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  Change to brown (10YR 4/1), dry to moist, hard.  Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.					CP C	Diei-	7-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3	While Drilling:	Date/		0/0					
CLAY mostly clay, high plasticity, brown (10YR 4/3) mottled with yellowish brown (10YR 5/6) and gray (10YR 5/1), dry to mosts, twen stiff.  SANDY CLAY mostly clay, some fine to coarse sand, very dark brown (10YR 5ND mostly clay, little fine to medium sand, trace to few fine to coarse gravel, low to medium plasticity, dark gray (10YR 5/1), moist, medium stiff.  SAND mostly fine to medium sand, trace sit, yellowish brown (10YR 5/6), moist, loose.  Change to brown (10YR 4/3) at 8.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.	7 (7.5)		Jilina		St. (	Oigil	IVII	After Drilling:	Date	rime _	2/8/10	13:34		- Depi	ın (π bgs) _	17.0
CLAY mostly clay, high plasticity, brown (10YR 4/3) mottled with yellowish brown (10YR 5/6) and gray (10YR 5/1), dry to moist, very stiff.  SANDY CLAY mostly clay, some fine to coarse sand, very dark brown (10YR 2/2), dry to moist, soft, trace coarse sands.  CLAY WITH SAND mostly clay, little fine to medium sand, trace to few fine to coarse gravel, low to medium plasticity, dark gray (10YR 4/1), moist, medium stiff.  SAND mostly fine to medium sand, trace sitt, yellowish brown (10YR 5/6), moist, loose.  Change to brown (10YR 4/3) at 8.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.	uV		TS	且			LITHOLOG	3IC				o o	AM		\C.	
CLAY mostly clay, high plasticity, brown (10YR 4/3) mottled with yellowish brown (10YR 5/6) and gray (10YR 5/1), dry to moist, very stiff.  SANDY CLAY mostly clay, some fine to coarse sand, very dark brown (10YR 2/2), dry to moist, soft, trace coarse sands.  CLAY WITH SAND mostly clay, little fine to medium sand, trace to few fine to coarse gravel, low to medium plasticity, dark gray (10YR 4/1), moist, medium stiff.  SAND mostly fine to medium sand, trace sitt, yellowish brown (10YR 5/6), moist, loose.  Change to brown (10YR 4/3) at 8.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.	ID TYPE	COVERY (	OW COUN	PTH IN FE							scs	WPHIC LO	ELL DIAGR	(	COMMEN	rs
with yellowish brown (10YR 5/6) and gray (10YR 5/1), dry to moist, very stiff.  SANDY CLAY mostly clay, some fine to coarse sand, very dark brown (10YR 2/2), dry to moist, soft, trace coarse sand sized coal fragments, trace fine gravel sized slag fragments.  CLAY WiTH SAND mostly clay, little fine to medium and, trace to few fine to coarse gravel, low to medium plasticity, dark gray (10YR 4/1), moist, medium stiff.  SAND mostly fine to medium sand, trace silt, yellowish brown (10YR 5/6), moist, loose.  Change to brown (10YR 4/3) at 8.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  CLAY mostly clay trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  CLAY mostly clay trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.	Y.	器	В	2				710.75				5	3			
moist, very stiff.  SANDY CLAY mostly clay, some fine to coarse sand, very dark brown (10YR 2/2), dry to moist, soft, trace coarse sand sized coal fragments, trace fine gravel sized slag fragments.  CLAY WITH SAND mostly clay, little fine to medium sand, trace to few fine to coarse gravel, low to medium plasticity, dark gray (10YR 4/1), moist, medium stiff.  SAND mostly fine to medium sand, trace silt, yellowish brown (10YR 5/6), moist, loose. Change to brown (10YR 4/3) at 8.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  CL  Thange to soft at 21.0 feet.  Change to very soft at 25.0 feet.  CL  Change to very soft at 25.0 feet.					CLAY n	nostly cla	y, high plasticity, b	rown (10YR 4/3) mo	ottled irv to		CL		1	Contin	UOUS sampling	With
CLAY WITH SAND mostly clay, little fine to medium sand, trace to few fine to coarse gravel, low to medium plasticity, dark gray (10)rk 4/1), moist, medium silff.  SAND mostly fine to medium sand, trace silt, yellowish brown (10YR 5/6), moist, loose. Change to brown (10YR 4/3) at 8.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.					SANDY dark bro	ery stiff. CLAY m own (10Yi	ostly clay, some fir R 2/2), dry to moist	ne to coarse sand, v	ery		CL			4-inch ground soil bo 6-inch	diameter casin d surface to ten oring, over-drille diameter casin	ng from minu ed wit ng to
trace to few fine to coarse gravel, low to medium plasticity, dark gray (10YR 4/1), moist, medium stiff.  SAND mostly fine to medium sand, trace silt, yellowish brown (10YR 5/6), moist, loose. Change to brown (10YR 4/3) at 8.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.  CL	3	90		5-						†	CI	11				
gray (10YR 4/1), moist, medium stiff.  SAND mostly fine to medium sand, trace silt, yellowish brown (10YR 5/6), moist, loose. Change to brown (10YR 4/3) at 8.0 feet.  CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.  The second of					trace to	few fine	o coarse gravel. In	w to medium plastic	city, da	rk _	CL	//				
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.					\gray (10	OYR 4/1),	moist, medium stif	f.		/						
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.					SAND I	mostly fin	e to medium sand,		brown		SP					
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.				10-				feet.			Je.					
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.		IJ.		1												
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.									, high	. 17		1//				
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.					Piasticit	, uaik gl	ه (۱۳۰۱ <del>۱</del> ۳۰۱), ary	to moist, natu.				1//				
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.		90		15-								111				
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.	0			-								111				
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.					¥							111				
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.												111				
Change to soft at 21.0 feet.  Change to very soft at 25.0 feet.												1//				
Change to very soft at 25.0 feet.	1			20-								111				
Change to very soft at 25.0 feet.					Change	to soft a	t 21.0 feet.				1 2	1//				
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30-	S	100		25-	Char	tove	off at 25 0 fact					111				
				THE RESERVE	Change	to very s	อบแ at ∠อ.U 1eet.				CL	1//	H			
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					1						F	111	A			
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M. Powers Checked By:

SAN	/PLE							Page 2 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			-	CLAY mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, very soft.				
5 CS	100		45					
					13			
			50-					
			-					
6 CS	80		55 —					
			7	Change to hard at 57.5 feet.  2-inch thick sand seam - mostly coarse sand, few fine to				
7 ST	100		60-	medium sand, trace silt, very dark gray (10YR 3/1), saturated, loose at 58.0 feet.				
			-	Change to no sand, no gravel, dark grayish brown (10YR 4/2) at 62.0 feet.				
8 CS	100		65 —		CL			
			1					
			70-	Change to dark gray (10YR 4/1) at 70.0 feet.				
á	453		2					
9 CS	100		75-					
			80-					
			4	Change to trace fine to coarse gravel at 82.0 feet.				
10 CS	100		85-					
			-					
			90-					
			-		4			

SAM	PLE							Page 3 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
11 CS	80		95	CLAY mostly clay, trace fine to coarse gravel, high plasticity, dark gray (10YR 4/1), dry to moist, very soft.  Change to soft at 95.0 feet.				
			100-	Change to stiff at 102.0 feet.				
12 CS	100		105-					
			110-					
13 CS	70		115-		CL			
			120-					
14 CS	100		125—					
			130					
15 CS	80		135—					
			140	SILT mostly silt, trace to few fine to coarse sand, non-plastic, dark gray (10YR 4/1), moist to saturated, medium stiff.  CLAY mostly clay, trace fine to coarse gravel, high plasticity, dark gray (10YR 4/1), saturated, very soft.	ML			
16 CS	100		145—					

	2		R	WELL CONSTRUCTION LOG	W	ELL		MW-16-03 Page 4 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			150-	CLAY mostly clay, trace fine to coarse gravel, high plasticity, dark gray (10YR 4/1), saturated, very soft.	CL			
17 CS	100		155 —	SILTY GRAVEL WITH SAND mostly fine to coarse gravel, little to some silt, few to little fine to coarse sand, trace cobbles, dark gray (10YR 4/1), saturated, dense to very dense.	GM			
18 CS	100		160— 	CLAY mostly clay, trace to few silt, few fine to coarse gravel,  few fine to coarse sand, low plasticity, dark gray (10YR 4/1), dry, hard.  SILTY GRAVEL WITH SAND mostly fine to coarse gravel, little silt, few to little fine to coarse sand, trace cobbles, dark gray (10YR 4/1), saturated, loose to dense.	GM			
19 CS	100		170—	SILTY SAND WITH GRAVEL mostly fine sand, little to some silt, little fine to coarse gravel, trace cobbles, dark gray (10YR 4/1), saturated, dense.  Change to mostly fine to coarse sand, few to little silt, saturated at 177.0 feet.	SM	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00	
			180 —	End of boring at 180.0 feet below ground surface.		91.7	E _	
			190 —					
			195—					

#### WELL CONSTRUCTION LOG WELL NO. MW-16-04 Page 1 of 4 Facility/Project Name: Date Drilling Started: Date Drilling Completed: Project Number: 5/18/16 5/24/16 231828.0000.0000 DTE Electric Company Range Road Landfill TOC Elevation (ft) Total Depth (ft bgs) | Borehole Dia. (in) Drilling Firm: Drilling Method: Surface Elev. (ft) Stock Drilling Sonic 596.87 594.07 210.0 Boring Location: NE of landfill, inside perimeter fence, near railroad crossing on Bree Rd. Personnel **Drilling Equipment:** Logged By - C. DoVono/J. Reed Driller - A. Goldsmith TSi 150cc N: 480291.59 E: 13625442.43 Civil Town/City/or Village: Water Level Observations: State: Date/Time Depth (ft bgs) While Drilling: East China St. Clair MI After Drilling: Date/Time 5/25/16 09:15 Depth (ft bgs) 19.11 SAMPLE **BLOW COUNTS** WELL DIAGRAM 8 DEPTH IN FEET LITHOLOGIC GRAPHIC LOG COMMENTS RECOVERY DESCRIPTION NUMBER AND TYPE uscs SILTY SAND mostly sand, little to some silt, brown (10YR Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to 4/3), moist, medium dense. SM install monitoring well. 65 5 CS SAND mostly fine to medium sand, brown (10YR 4/3), moist, loose. SP 10 CLAY mostly clay, few silt, medium plasticity, dark gray (10YR 4/1), moist, stiff. cs cs 70 15 20 3 CS 0 25 CORP.GDT CL 30 Change to high plasticity at 30.0 feet. CONSTRUCTION LOG 231828.0000.0000.GPJ Change to soft at 34.5 feet. 100 35 CS 40 100 45

Signature: Succession

Firm: TRC Environmental Corporation 1540 Eisenhower Place Ann Arbor, Michigan

	IPLE			NEEL CONCINCOTION LOC			P	'age 2 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50 —	CLAY mostly clay, few silt, high plasticity, dark gray (10YR 4/1), moist, soft.				
6 CS	100		55 —					
			60 –					
7 CS	100		65 —					
			70-					
8 CS	65		75-		CL			
			80-				VA VA	
9 CS	100		85-					
			90-					
10 CS	85		95-	Change to medium stiff at 94.5 feet.				
1			100					
11 CS	100		105-	Change to stiff at 103.0 feet.				

SAM		TI	RC		w	ELL		MW-16-04 Page 3 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	90		110-	CLAY mostly clay, few silt, trace sand, high plasticity, dark gray, moist, stiff.				
13 CS	55		125	Change to very soft at 123.0 feet.	CL			
14 CS	100		135—	SILTY CLAY mostly clay, some silt, little gravel, dry, hard, hardpan.				
15 CS	100		145		CL- ML			
			150	SAND mostly fine to medium sand, gray (10YR 5/1), moist.	SP	<i>1/1X</i>		
16 CS	100		155—	SILTY SAND WITH GRAVEL little gravel, gray (10YR 5/1), moist, very dense, hardpan.	SM	D 20 D 20 D		
17 CS	80		165	SILT mostly silt, trace to few fine sand, trace gravel, gray (10YR 5/1), moist.	ML	100		
			170-	Change to dry to moist at 170.0 feet.			9 9	

	2	T	RO	WELL CONSTRUCTION LOG	w	ELL N	O. MW-16-04 Page 4 of 4
SAM	1PLE						1 age 4 01 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	MELL DIAGRAM COMMENTS
18 CS	100		175-	SILT mostly silt, trace to few fine sand, trace gravel, gray (10YR 5/1), dry to moist.	ML		
			180-	SILTY SAND mostly fine to medium sand, little silt, gray (10YR 5/1), moist to saturated, loose to medium dense.  Change to few to little silt at 182.0 feet.	SM		
19 CS	100		185	SILT mostly silt, trace to few fine sand, trace gravel, gray (10YR 5/1), moist, medium dense to dense.		3)3333	
20			190-	Change to dry at 190.5 feet. Change to trace sand at 191.0 feet.	ML		
20 CS	100		195—	Change to few to little sand, moist at 198.0 feet. Change to few sand at 199.0 feet.			
			200	SANDY SILT mostly silt, little to some sand, gray (10YR 5/1), moist, loose to medium dense.	ML		
21 CS	100		205-	SILT mostly slit, trace sand, trace gravel, dark gray (10YR 4/1), dry to moist, very dense, hardpan.	ML		
			210	End of boring at 210.0 feet below ground surface.		Ш	
			215—				
		×	220-				
			225				
			230				

acility	/Projec	t Name	9:				Date Drilling Start	ed:	Date D	Orilling I	Complet		Page 1 Project	of 3 Number:
				c Compa	any Range	Road Landfill	5/12/16		3.16.2	3	3/16		The last	28.0000.0000
rilling	Firm:		10000	S.A. (45) (2	Drilling M	Company of the compan	Surface Elev. (ft)		C Elevatio	n (ft)	Total I	Depth (		Borehole Dia. (in)
	S	lock I	Drillin	g		Sonic	601.97		599.62	2		140.0		6
Boring	Locatio	n: SV	V of lan	dfill, near P	uttygut Rd. ga	ate closest to King Rd.	Personnel Logged By - C. I	201/000			Drilling	Equip	ment:	
N: 47	4831.3	0 E:	1362	2242.19			Driller - A. Golds						TSi 15	i0cc
Civil To	own/Cit	y/or Vil	lage:	County:		State:	Water Level Observiile Drilling:		s: ate/Time				Depth	(ft bgs)
E	East (	China		St	t. Clair	MI	After Drilling:			5/18/	16 11:40	_ 1		(ft bgs) <u>25.67</u>
SAM	PLE					1-1-12-							7	
AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET		. Lane	LITHOLO DESCRIP	TION			nscs	GRAPHIC LOG	WELL DIAGRAM	Co	OMMENTS
ıs	50		5-	moist,	, stiff.		ome silt, brown (10	/R 4/3	3),	CL- ML			6-inch d	ous sampling with iameter casing from surface to terminus ng, over-drilled with iameter casing to onitoring well.
2.5	70		10-	CLAY	mostly c	lay, dark gray (10Y	R 4/1), moist, stiff.							
			20-				ty, soft at 20.0 feet.							
s S	70		25 —	Chan <u>▼</u>	ge to stiff	at 22.0 feet.				CL				
			30-	Chan	ige to soft	at 30.0 feet.				CL				
4 :5	70		35-											
			40-	Chan	ige to dark	k grayish brown (10	YR 4/2) at 40.0 fee							
5	100		45-											

C. Scieszka

	9	T	RO	WELL CONSTRUCTION LOG	w	ELL	NO.	MW-16-05 Page 2 of 3
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	ς,	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
AND	REC	BLO	DEP.	CLAY mostly clay modium to high placticity dark grayish	SOSU G	GR.		
6 CS	70		50 -	CLAY mostly clay, medium to high plasticity, dark grayish brown (10YR 4/2), moist, soft.  SILTY SAND mostly sand, little to some silt, trace gravel.  CLAY mostly clay, medium to high plasticity, dark grayish brown (10YR 4/2), moist, soft.	SM			
7 CS	100		65					
8 CS	90		70 —	Change to very dark gray (10YR 3/1) at 70.0 feet.				
			80-	Change to dark gray (10YR 4/1), wet at 80.0 feet.	CL		M	M
9 CS	80		85-	Change to stiff at 87.0 feet.				
10 CS	80		90 —	Change to moist, high plasticity at 90.0 feet.				
			100-	Change to medium plasticity at 100.0 feet.				
9 CS	100		105-					

SAN			RO		WELL NO. MW-16-05  Page 3 of 3							
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS				
12 CS	100		110—	CLAY mostly clay, medium plasticity, dark gray (10YR 4/1), moist, stiff. Change to very soft, high plasticity at 110.0 feet.	CL							
13 CS	100		120	GRAVEL WITH SAND mostly fine to coarse gravel, little medium to coarse sand, trace cobble, brown (10YR 4/3), saturated.								
14 CS	100		130-		GW							
			140	End of boring at 140.0 feet below ground surface.		° ()						
			150									
			155—									
			160 —									
			170—									

10		l l	70								VV	ELLI		Page 1	-16-06 of 3
acility	y/Projec	t Name	20					Date Drilling Started	d:	Date 0	Orilling (	Complet			t Number:
	E	TE E	lectri	c Compan	y Range	Road Lan	dfill	5/2/16			5/10	0/16		2318	828.0000.0
rilling	Firm:				Drilling Me	ethod:		Surface Elev. (ft)	TOC	Elevatio	n (ft)	Total D	epth (	it bgs)	Borehole Dia.
			Orillin			Sonic		598.00	1 1	600.68	3		40.0		6
		10	0 feet E	of jog in N fe	tely 20 feet s ence.	S of N fence, a	approximately	Personnel Logged By - J. Re		cieszka		Drilling	- 6		43.7
	9837.9 own/Cit			3393.48 County:		State:		Driller - A. Goldsm Water Level Obser	309%		_		-	TSi 1	50cc
				2000	Clair	State.	MI	While Drilling:	Dat	e/Time	0/0/4	0.44.00		Dept	h (ft bgs)
SAM	East (	Jnina		ા.	Clair		IVII	After Drilling:	Dat	e/Time	_6/9/1	14.22		Dept	h (ft bgs) 21
AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET			Di	ITHOLOGIC ESCRIPTION	N.			nscs	GRAPHIC LOG	WELL DIAGRAM	C	COMMENTS
	100		5—	SILTY ( mediun mediun	n sand, lo	ostly clay, ow plasticit	ittle to some y, dark gray	silt, trace to few (10YR 4/1), mois	fine t	0				ground soil boi 6-inch	uous sampling wi diameter casing I surface to termi ring, over-drilled v diameter casing I monitoring well.
S	10		15—												
			-	Ā							CL-				
S	100		25— -								ML				
			30-												
S	100		35-												
			40 -	Chang	e to trace	e fine to me	edium sand a	at 40.0 feet							
S	100		45-												

C. Scieszka Checked By:

SAM	IPLE						P	Page 2 of 3
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50-	SILTY CLAY mostly clay, some silt, trace fine to medium sand, dark gray (10YR 4/1), moist, medium stiff.				
6 CS	100		55— - - -					
7 CS	100		65		CL- ML			
Co			- - - 70—					
8 CS	100		75-					
			80-	SILT mostly silt, trace fine sand, non plastic, dark gray (10YR 4/1), moist, stiff.	ML			
9 CS	100		85-	SAND mostly fine sand, trace to few silt, dark gray (10YR 4/1), saturated, medium dense. Change to no silt at 87.0 feet. Change to mostly medium sand at 89.0 feet.				
10 CS	100		95—	Change to mostly medium to coarse sand, trace fine gravel at 91.0 feet. Change to mostly coarse sand, few fine to medium sand, few fine to coarse gravel at 93.0 feet.				
			100-	Change to mostly fine sand, no gravel at 97.0 feet.  Change to trace silt at 99.5 feet.  Change to mostly medium to coarse sand, few fine to coarse gravel at 100.0 feet.	SP			
11 CS				graver at 100.0 100t.				

	9	T	RC	WELL CONSTRUCTION LOG	WELL NO. MW-16-06 Page 3 of 3						
YPE YPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION		GRAPHIC LOG	WELL DIAGRAM	COMMENTS			
NUMBER AND TYPE	RECO'	BLOW	DEPT		nscs	GRAP	WELL				
12 CS	100		110-	SAND mostly medium to coarse sand, few fine to coarse gravel, trace silt, dark gray (10YR 4/1), saturated, medium dense.  Change to mostly fine to medium sand, no gravel, trace silt at 112.5 feet.							
13 CS	100		125-		SP						
1			130-	SHALE dark gray (10YR 4/1), dry, brittle.	-						
14 CS	100		135								
			140	End of boring at 140.0 feet below ground surface.							
			145 —	End of boring at 140.0 feet below ground surface.							
			165—								

1			70											MW-1 Page 1	of 3	
acility	//Projec			17:157	AL-78	L. St. V. S. D.	Date Drilling		i:	Date D		Complet	ed:		Number:	
-101		TEE	lectri	c Compar	Drilling N	e Road Landfill	5/1 Surface Elev	1/16	LTOC	Elevatio		2/16 Total D	anth (		28.0000 Borehole D	
rilling	Firm:		S. 1117-	_	Drilling N				2000		0.0	1000	140.0			
orina			Orillin of lands	g ill, near forme	r weather s	Sonic	589.4 Personnel	U		589.34	•	Drilling			6	_
					weather s	station,	Logged By					D,	-quip			
	The second section		12	3511.65		Louis	Driller - A.	CHAIR ZEALS	1435					TSi 15	00cc	
	own/Cit			County:		State:	Water Level While Drilli			e/Time					(ft bgs)	
	East C	China		St.	Clair	MI	After Drillin	g:	Date	e/Time	5/18/	16 09:30	Ī	Depth	(ft bgs) _	18.05
SAM	PLE															
	(%)	BLOW COUNTS	DEPTH IN FEET			LITHOLO						90	WELL DIAGRAM	C	OMMEN	JTS
ᇤ	RECOVERY (%)	ō	Z L			DESCRIPT	TION					GRAPHIC LOG	OIAG	0,	SIVIIVILIY	
	8	W	Ŧ								S	APH	7			
AND TYPE	Ä	BLC	DEF								nscs	GR	WE			
				CLAY	mostly o	lay, dark grayish bro	own (10YR 4/2)	with I	browr	1		///	1	Continu	our round	a with
1				and gra	ay mottli	ng, moist, stiff.					1.5	111		4-inch d	ous sampling liameter casi surface to te	y with ing from
\B												111		A SOIL DOOR	no over-drill	led with
			5-	Chana	o to dad	gray (10YR 4/1), so	off at 5.0 foot					111		install m	liameter casi nonitoring we	1.
				Change	e to dark	ylay (101K 4/1), SC	ni ai J.U 1661.					1//		3		
											1	1//		1		
	100		4									///				
s	40	1118	10-											3		
п			-									11/		1		
												11/				
и			15-									111				
-			-									1//		3		
- 8				▼										3		
			-													
7	1		20 –	Chang	e to wet	at 20.0 feet.					1 - 8					
				ALY JES								1//		3		
ш			-								CL	1//		3		
2	100		25-	1								111				
S			-	-								1//		3		
	-			1								1//				
												1//				
			30 -	1								1//				
												111				
			100									111				
3 3	100		35 -								1	111				
S	,50		-									11	1			
												111	1			
				Chan	o to us-	dark grov (40VD 2	/1) maint at 20	O foo	+			1//	1			
-			40-	Chang	e to ver	y dark gray (10YR 3	rt), moist at 39	o iee				111	1			
				1								1//	1			
				-								111				
4	100		AF									111				
4 0S	100		45-									11	1			
													1/1	and a		

SAN		TF	WELL CONSTRUCTION L			MW-16-07 lage 2 of 3
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS		nscs	GRAPHIC LOG WELL DIAGRAM	COMMENTS
			CLAY mostly clay, very dark gray (10YR 3/1), moist, s	oft.		
5 CS	75	Ę	5— 1			
		6				
6 CS	100	(	5-			
		į		CL		
7 CS	100	,	Change to stiff at 76.0 feet.			
		8	D			
8 CS	100		5-			
		9	SILTY SAND mostly sand, little to some silt, dark gra	./10VP		
9 CS	100		4/2), moist to saturated.  SAND mostly fine to medium sand, dark gray (10YR saturated.	SIVI		
		10	Change to mostly fine sand, gray (10YR 5/1) at 100.0	feet.		
10 CS	90	10	5—			

SAM	IPLE		R				F	Page 3 of 3
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			110-	SAND mostly fine sand, gray (10YR 5/1), moist to saturated.	SP			
11	100		115	SAND WITH GRAVEL mostly medium sand, little fine to coarse gravel, gray (10YR 5/1), moist to saturated.  SAND mostly fine sand, gray (10YR 5/1), moist to saturated.	SP	0 0		
1			120	SAND WITH GRAVEL mostly fine sand, little gravel, moist to	SP			
12	100		125	saturated.  SILTY SAND mostly sand, little to some silt, dark gray (10YR // 4/1), moist to saturated.  SAND WITH SILT mostly sand, few silt, dark gray (10YR 4/1), moist to saturated.	SP- SM			
			130	SAND WITH GRAVEL mostly medium to coarse sand, some gravel, moist to saturated.	SP	0 0		
			1 1 1 1 1	GRAVEL WITH SAND mostly gravel, little coarse sand, saturated.	GW			
13 CS	100		135	SAND WITH SILT mostly sand, few silt, dark gray (10YR 4/1), moist to saturated.	SP- SM			
			140-	GRAVEL WITH SAND mostly gravel, some sand, saturated.  End of boring at 140.0 feet below ground surface.	GW	0 (		
		ŀ	145—					
			150-					
			155—					
			160-					
			165					
			170-					

	J.	T	70			- 2217.53	RING LOG		во	RING			-16-01
Facilit	y/Projec	t Nam	a.				Date Drilling Starte	d:	Date Drilling	Comple			1 of 4 ct Number:
acility				C	u D-	Dood Louden					wu.	100	
Detre	_	ЛE	ectric	compan		Road Landfill	2/2/16	TOS		3/16 Total	Dooth (		828.0000.0000
Drilling		Co.			Drilling Me		Surface Elev. (ft)	100	Elevation (ft)		Depth (f	7.7	Borehole Dia. (in)
			Drilling			Sonic	593.98				168.0		6
Boring	Location Location		' E of W I. gate.	fence, 85' S	of N fence,	on W side of landfill near King	Personnel Logged By - C. So Driller - A. Goldsn			Drillin	g Equip		150cc
Civil T	own/Ci	y/or Vi	lage:	County:		State:	Water Level Obser					-2-	41.673.274
	East (	China		St.	Clair	MI	While Drilling: After Drilling:		e/Time e/Time	_			th (ft bgs) th (ft bgs)
SAM	IPLE												
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET			LITHOLOG DESCRIPT				nscs	GRAPHIC LOG	C	COMMENTS
				TOPSO	IL dark I	orown (10YR 3/3), mois	st. loose, roots.				1		
1 CS	50		5-	CLAY is sand, mottles	nostly cla nedium to (10YR 4	ay, trace fine to coarse b high plasticity, dark gr /3), dry, hard, roots.	gravel, trace fine	e to co	oarse own			4-inch ground soil bo 6-inch	nuous sampling with diameter casing from d surface to terminus of oring, over-drilled with diameter casing to monitoring well.
US						ots at 5.0 feet.							
			10-			gray (10YR 4/1) at 7.5							
			10	Change at 10.0	e to no sa feet.	and, no gravel, high pla	sticity, gray (10\	'R 5/1	), moist				
cs cs	40		15— - -	Change	e to soft a	at 15.0 feet.							
			20 —	Change	e to very	soft at 20.0 feet.				CL			
3 CS	100		25-										
			30-										
4 CS	100		35-										

Firm:

TRC Environmental Corporation 1540 Eisenhower Place Ann Arbor, Michigan 734.971.7080 Fax 734.971.9022

Checked By: M. Powers

	MPLE	T	70	SOIL BORING LOG BO	ORING		<b>SB-16-01</b> age 2 of 4
NUMBER AND TYPE	(%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	COMMENTS
			40-	CLAY mostly clay, high plasticity, gray (10YR 5/1), moist, very soft.			
5 CS	90		- - 45 — -				
6 ST	100		50 —				
7 CS	80		55—				
-			60-		CL		
8 CS	100		65-				
			70-	Change to dark gray (10YR 4/1) at 70.0 feet.			
9 CS	100		75-				
			80-				
10 CS	100		85—				

BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION  CLAY mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.  Change to stiff at 89.0 feet.	nscs	GRAPHIC LOG	COMMENTS
		soft. Change to stiff at 89.0 feet.			
	95				
	95	Change to trace to few fine to coarse sand, trace to few fine to coarse gravel at 92.0 feet.			
	-	Change to hard at 95.0 feet.			
	-				
	100	Change to no sand, no gravel, stiff at 100.0 feet			
	105				
	-				
	110-		CL		
	-				
	115-				
	1-1-				
	120-				
	-				
	-				
	130-	Change to trace to few fine to coarse sand at 130.0 feet.			
		110—	110-	110— 116— 120— 125—	110- 1115- 115- 120- 125-

SAM	IPLE					Pa	age 4 of 4
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	nscs	GRAPHIC LOG	COMMENTS
15 CS	100		135 —	CLAY mostly clay, trace to few fine to coarse sand, high plasticity, dark gray (10YR 4/1), moist, stiff.	CL		
16 CS	100		145 —	Change to few fine to coarse sand, few fine to coarse gravel, hard at 147.5 feet.			
17 CS	100		150—	SHALE dark gray (10YR 4/1), layered, brittle, weathered.			
			160-				
18 CS	100		165 — -	End of boring at 168.0 feet below ground surface.			
			170-				
			175— - - - - 180—				

													of 3
acilit	y/Projec	t Name	9:				Date Drilling Starte	d:	Date Drilling	Complet	ed: F	rojec	t Number:
	0	TE E	lectr	ic Compan	y Range	Road Landfill	2/5/16		2/9	/16		2318	328.0000.000
Orilling	Firm:				Drilling Me		Surface Elev. (ft)	TOC	Elevation (ft)	Total D	epth (ft l	bgs)	Borehole Dia. (in
	S	tock I	Drillin	g		Sonic	593.55				40.0		6
Boring					of N fence,	in NW corner of landfill.	Personnel			Drilling	Equipme	ent:	-
							Logged By - C. So Driller - A. Goldsn			17	т	Ci 1	50cc
Civil T	own/Cit	v/or Vil	lage.	County:		State:	Water Level Obser	200002			- 1	31 1	5000
				to verse.	20.00	200	While Drilling:	5.5.5.5.5	te/Time			Depti	n (ft bgs)
_	East (	China	7	St.	Clair	MI	After Drilling:	Da	te/Time			Dept	h (ft bgs)
SAM													
AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET			LITHOLO DESCRIP				nscs	GRAPHIC LOG	С	OMMENTS
						ostly fine to medium			dark		1174	Contin	, , , , , , , , , , , , , , , , , , ,
Н			-			(10YR 4/4), moist, m	lealum aense, root	S.			11:13 4	4-inch	ious sampling with diameter casing fron surface to terminus
ш			ż	Change	to no ro	ots at 2.5 feet.					Title !	soil bor	ing, over-drilled with diameter casing to
1	50		-	17						SM			nonitoring well.
S	50		5-										
				Oh		- h (40)(D 4(0)							
			1		e to dens 5/8) at 7.	e, brown (10YR 4/3)	mottled with yellow	visn D	rown		1111		
-1						ne sand, trace to few	silt, trace fine gray	el. br	own	SP	1111		
			10-			rated, medium dens				-	111		
Y				CLAY I	mostly cla	ay, trace fine to coars	se sand, trace fine	to co	arse				
			- 4	gravel,	medium	plasticity, gray (10YF	R 5/1), moist, hard.						
2	100		15-	Change	to high	plasticity, stiff at 15.0	feet				1//		
			1	o nange	to mgm	placticity, our at roll	10011						
			1										
ш		11.17	H										
-8		l K	20 -	Change	to vone	noff at 20 0 foot				1			
				Change	e to very	soft at 20.0 feet							
			-										
Л			-										
3 CS	60		25-										
S				c.						CL			
			1							-	1//		
			7	10									
			20										
Y			30-										
											1//		
			14								1//		
4	8.5.		0.0								1//		
4 SS	100		35 –										
			1 3								1//		
										1	1//		
			- 3								111		
-			40-								1//		
											1//		
		4								1	1//	100	

	SOIL BORING LOG  BORING NO. SB-16-02  Page 2 of 3										
SAM	IPLE	11	T								
NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION		nscs	GRAPHIC LOG	COMMENTS			
5 CS	100		45-	CLAY mostly clay, trace fine to coarse sand, trace fine to coarse gravel, high plasticity, gray (10YR 5/1), moist, very soft.  Cobble present at 48.0 feet.							
6 CS	100		55—	Change to no sand, no gravel at 50.0 feet.							
7 CS	100		65-			CL					
3			70-								
8 CS	100		75-								
			80-	Change to trace fine to coarse sand at 77.5 feet.  SILT mostly silt, trace to few fine sand, non-plastic, dark gray (10YR 4/1), moist to saturated, stiff.  SILTY SAND mostly fine to medium sand, few to little silt, dark gray (10YR 4/1), saturated, dense.		ML					
g CS	100		85 — -	CLAY mostly clay, trace fine to coarse sand, high plasticity, gray (10YR 5/1), moist, very soft.		CL					
			90-	SILT WITH SAND mostly silt, few to little fine to coarse sand, trace fine to coarse gravel, non-plastic, dark gray (10YR 4/1), moist, very stiff.  CLAY mostly clay, trace to few fine to coarse gravel, trace to few fine to coarse sand, low to medium plasticity, dark gray (10YR 4/1), dry, hard.		ML					
10 CS	100		95 —			OL.					

	2	r	R	SOIL BORING LOG BOF	RING		SB-16-02 Page 3 of 3
SAM	IPLE (%)	ITS	ET	LITHOLOGIC		90	COMMENTO
AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	DESCRIPTION	nscs	GRAPHIC LOG	COMMENTS
111 CS	100		100 — 105 — 115 — 125 — 135 —	SILTY SAND WITH GRAVEL mostly fine to medium sand, little to some silt, few to little fine to coarse gravel, dark gray (10YR 4/1), moist to saturated, dense.  CLAY mostly clay, trace to few fine to coarse gravel, trace to few fine to coarse sand, high plasticity, dark gray (10YR 4/1), moist, stiff.  Change to soft at 106.0 feet.	CL		4-inch sample rods sank under weight of casing due soft clay from 110 feet to 12 feet when cased off to 110 feet with 6-inch casing rods
			140—	SHALE dark gray (10YR 4/1), dry, hard, weathered, not brittle.  Change to competent, layered at 139.5 feet.  End of boring at 140.0 feet below ground surface.			