Groundwater Monitoring System
Summary Report

DTE Electric Company
Range Road Coal Combustion Residual Landfill

3600 Range Road
China Township, Michigan

October 2017

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Prepared For
DTE Electric Company

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Section 1
Introduction

1.1 Background and Objective

The United States Environmental Protection Agency (U.S. EPA) established a comprehensive set of requirements for management and disposal of coal combustion residuals (CCR) in landfills and surface impoundments in the Final Rule: Disposal of CCR from Electric Utilities (CCR Rule) on April 17, 2015. The DTE Electric Company (DTE Electric) Range Road Landfill (RRLF) CCR unit is subject to the CCR Rule.

The objective of this report is to document and certify that the CCR Groundwater Monitoring System for the RRLF has been designed and constructed to meet the requirements of Title 40 Code of Federal Regulations (CFR) §257.91 (a)(1) and (2) of the CCR Rule. TRC Engineers Michigan, Inc. (TRC) was retained by DTE Electric to provide this report documenting the construction of the CCR groundwater monitoring system for the RRLF.

1.2 Site Location

The RRLF is located in Section 12, Township 4 North, Range 16 East, 3600 Range Road, China Township in St. Clair County, Michigan (**Figure 1**). The site occupies approximately 514 acres one-half mile west of the St. Clair River and one mile north of the Belle River Power Plant.

1.3 Description of CCR Unit

Prior to Detroit Edison's operations commencing in the 1950s, the RRLF property was used as farmland. The property has been 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 and 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 approximately 402 acres are designated for landfill development[1]. CCR currently occupies approximately 200 acres of the RRLF and the landfill is estimated to have several decades of capacity remaining (**Figure 2**).

The RRLF is a licensed Type III solid waste disposal facility in accordance with Michigan's regulations, and is owned and operated by DTE Electric. 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. The RRLF is operated under the current operating license number 9395 in accordance with Michigan Part 115 rules.

[1] Geosyntec Consultants, 2016, 2016 Annual Inspection Report Range Road Landfill Ash Disposal Facility

Section 2
Hydrogeology

2.1 Regional Hydrogeologic Setting

The geology of St. Clair County consists of approximately 101 to 400 feet of glacial deposits, primarily lacustrine deposits, till, and, to a lesser extent, sand and gravel outwash, overlying a variety of bedrock surfaces[2]. The thicker glacial deposits are present toward the central portion of the county. Bedrock in the county includes the Michigan Formation, Marshall Sandstone, Coldwater Shale, Sunbury Shale, Berea Sandstone, Bedford Shale, and Antrim Shale.

In the vicinity of the site, the Devonian Bedford and/or Antrim Shale bedrock dips to the northwest and is generally covered by more than 100 feet of unconsolidated clay, silt, sand, and gravel. Also running from roughly northeast to southwest is a bedrock valley that includes the northeastern corner to the south central portion of the RRLF site in a geologic "Bedrock Valleys" layer on the Michigan Department of Environmental Quality (MDEQ) GeoWebFace website (http://www.deq.state.mi.us/GeoWebFace/). In this area, generally on the eastern side of the county, the glacial deposits are predominantly silty-clay till and lacustrine deposits with lenses of sand and gravel. Where present, unconsolidated sand and gravel deposits within the till and lacustrine deposits are generally used for water supply throughout the county. Approximately 85 percent of the water supply wells in St. Clair County are completed in the glacial deposits compared to approximately 13 percent installed in bedrock[2].

The current topography of the St. Clair area gently undulates reflecting floodplain, stream terrace, and lakeshore deposits. The St. Clair River is the major surface water body in the county and runs along the eastern boundary of the county. Regional groundwater and surface water flow would be expected to be to the east towards the St. Clair River.

2.2 RRLF Hydrogeology

Local deeper geology presented within this report for the site was primarily based on soil boring data collected during the groundwater monitoring system installation detailed below in Section 3, in addition to historical oil well logs from the MDEQ GeoWebFace website (http://www.deq.state.mi.us/GeoWebFace/). Soil borings are included in Appendix A and generalized geologic cross sections are provided in **Figures 3 through 6**.

[2] Beth A. Apple and Howard W. Reeves, 2007, Summary of Hydrogeologic Conditions by County for the State of Michigan. U.S. Geological Survey Open-File Report 2007-1236, 78 p.

Glacial and lacustrine deposits throughout the area of the RRLF range from 130.5 to 303 feet below ground surface (feet-bgs). On a significant portion of the RRLF, there is a bedrock valley that trends from the northwest corner to the south central portion of the RRLF. 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 site, the bedrock valley extends to depths of up to 303 feet-bgs (see **Figure 3** for estimated horizontal extent of the bedrock valley). Along the western portion of the RRLF, clay-rich till is present continuously to the top of the underlying Bedford or Antrim Shale bedrock (see soil boring logs SB-16-01 and SB-16-02 in Appendix A). The low permeability clay till and impermeable shale bedrock does not yield groundwater (i.e., is not an aquifer), rather it prevents groundwater flow and results in a no flow boundary along the western portion of the RRLF (**Figure 3**).

In general, the RRLF is initially underlain by 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. Water supply wells in the vicinity of the site are commonly present in the unconsolidated sand and/or gravel at depths ranging from 100 to 150 feet-bgs. These water supply wells similar to the uppermost aquifer monitoring wells installed at the RRLF are screened beneath substantial deposits of clay-rich till (on the order of 86 to 188 feet thick) that serve as a natural confining hydraulic barrier that isolates the underlying aquifer.

The nearest water supply wells are located primarily to the north and northeast of the RRLF with some wells being located within 300 feet of the site. Surface water bodies present in the area of the RRLF include the Layle Robbins Drain (as close as 200 feet northwest of RRLF), the Pine River (as close as 500 feet north of RRLF), and the St. Clair River (as close as 0.5 mile to the east of RRLF).

2.2.1 Uppermost Aquifer

Definition

The 40 CFR §257.53 definitions of an aquifer and uppermost aquifer are as follows:

- *Aquifer* means a geologic formation, group of formations, or portion of a formation capable of yielding useable quantities of groundwater to wells or springs.
- *Uppermost aquifer* means the geologic formation nearest the natural ground surface that is an aquifer, as well as the lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season.

Site Uppermost Aquifer

As described above, the RRLF sand/gravel uppermost aquifer as defined in 40 CFR §257.53 is present beneath a vertically extensive clay-rich till, at least 86 and up to 188 feet thick, that serves as a natural confining hydraulic barrier that isolates the underlying uppermost aquifer (**Figures 3 through 6**). The low permeability clay-rich soil consistently has a hydraulic conductivity on the order of 2 to 3 x 10^{-8} centimeters per second (cm/s) as found in historical soil testing and further verified during recent soil permeability testing performed on soil samples collected during the CCR monitoring well installations.

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 feet-bgs. 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 (see cross-sections in **Figures 3 through 6**). 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.

2.2.2 Groundwater Flow

Groundwater Flow Direction

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 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 RRLF 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, it is not possible for the uppermost aquifer to have been affected by CCR from operations that began in the 1950s (see vertical travel time of travel discussion below). In addition, under the Michigan Part 115 solid waste program, RRLF has been

granted a waiver and is not required to monitor units beneath the clay-rich confining unit due to its thickness, continuity and low hydraulic conductivity.

The collection of the eight independent samples from the groundwater monitoring system monitoring wells in accordance with the CCR Rule began in August 2016. Several rounds of potentiometric surface elevation data collected during groundwater monitoring events are displayed on **Figure 7**. For the aforementioned reasons, groundwater contours or flow directions were not inferred using the potentiometric surface data.

Uppermost Aquifer Hydraulic Conductivity

Hydraulic conductivities measured within the CCR monitoring wells using single well hydraulic conductivity tests (e.g., slug tests) range from approximately 0.05 feet/day to 342 feet/day. This range in hydraulic conductivities further demonstrates the heterogeneity across the various uppermost aquifers encountered at the site.

Horizontal Time of Travel

In order to evaluate potential horizontal time of travel, a the maximum potential gradient was estimated using the mean groundwater potentiometric surface elevations measured at MW-16-03 in the northeastern portion of the RRLF and MW-16-07 in the southwestern portion of RRLF during seven representative 2016 and 2017 groundwater sampling events, with an eighth event subsequently completed by October 17, 2017. The resulting maximum horizontal gradient potential for groundwater flow is approximately 0.0009 foot/foot for these seven events. Assuming a conservative average porosity of 0.4 for the sand/gravel in the uppermost aquifer, the low hydraulic conductivity of 0.05 feet/day, and high hydraulic conductivity of 342 feet/day, and a hydraulic gradient of 0.0009 foot/foot for the sand-rich uppermost aquifer at RRLF, the potential horizontal groundwater flow rate ranges from approximately 0.000062 feet/day (0.023 feet/year) to 0.76 feet/day (~278 feet/year) for the sand-rich uppermost aquifer at RRLF.

Vertical Time of Travel

The RRLF is underlain by a natural confining hydraulic barrier which has been verified by numerous historical soil borings and further confirmed by the nine soil borings installed as part of the CCR monitoring system installation. Therefore, the geology and hydrogeology of the site assures environmental protection of the uppermost aquifer. Based on the site geology and hydrogeology, there is extremely low potential for the landfill to affect groundwater within the underlying uppermost aquifer in the future. Groundwater present within the deep confined uppermost sand/gravel aquifer is

protected from landfill constituents by the over 85 feet thick clay-rich aquitard with low hydraulic conductivity. Using the hydrogeologic information for the site, the time of travel for water from the base-grade elevation of the RRLF down to the uppermost aquifer can be calculated using the following formula:

$$V = Ki/N_e$$

Where:

V = Velocity (feet/day)

K = Hydraulic Conductivity (3×10^{-8} cm/s based on high end silty clay-rich soil geotechnical measurements)

i = Downward Vertical Gradient (conservatively assumed to be one foot/foot)

N_e = Effective Porosity (0.5 for clay-rich soil)

From the above formula, the maximum downward flow velocity through the silty-clay confining till to the uppermost aquifer is 6×10^{-8} cm/sec, or 0.063 feet/year (lower than typical hydraulic conductivity requirement of 1×10^{-7} cm/sec for landfill liners). Therefore, the time of travel for liquid from the base of the RRLF through 86 feet of silty-clay (thinnest section of silty-clay confining unit found on RRLF above the uppermost aquifer) to the uppermost aquifer is over 1,300 years. Given that RRLF operations began in the 1950s, approximately 65 years ago, there is no potential for the uppermost aquifer wells to be affected from the RRLF CCR unit.

Section 3
Groundwater Monitoring System

3.1 Groundwater Monitoring System Installation

During 2016, TRC, on behalf of DTE Electric, oversaw the installation and development of the RRLF groundwater monitoring system in accordance with 40 CFR §257.91. Seven monitoring wells (MW-16-01 through MW-16-07) were installed at the RRLF by a Michigan-licensed well driller in order to establish the groundwater monitoring system as described below:

3.1.1 Soil Boring Advancement

In 2016, nine soil borings were advanced along the perimeter of the RRLF to evaluate the subsurface geology and to allow monitoring well installation using sonic drilling techniques with 4-inch and 6-inch tooling. Soil samples were collected continuously in 10-foot sections from the ground surface to the termination of the soil boring. A TRC geologist was present to log each boring and describe the soil samples in accordance with the Unified Soil Classification System (USCS).

The soil borings were advanced to depths ranging from approximately 140 to 220 feet-bgs to within the first encountered saturated unconsolidated coarse-grained unit identified as the uppermost aquifer, and/or into the top of the underlying shale bedrock. Along the western portion of the RRLF clay-rich till is present continuously to the top of the underlying Bedford or Antrim Shale bedrock (see soil boring logs SB-16-01 and SB-16-02 in Appendix A). The low permeability clay till and impermeable shale bedrock does not yield groundwater (i.e., is not an aquifer), rather it prevents groundwater flow and results in a no flow boundary along the western portion of the RRLF (**Figure 3**). The variability in boring depth 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 that, where present, is first encountered at depths ranging from 86 to 196 feet-bgs.

3.1.2 Monitoring Well Installation

Based on the presence of the no flow boundary on the west edge of the site, the presence of the horizontally and vertically extensive clay-rich till, and depths to the uppermost aquifer in each soil boring location, a total of seven CCR monitoring wells (MW-16-01 through MW-16-07) were screened within the uppermost portion of the uppermost aquifer. Screened intervals in these monitoring wells range from 90 to 95 feet-bgs to 202 to 207 feet-bgs at the seven locations around RRLF's northern, eastern and southern

boundaries (**Figures 3 through 6**). As previously noted, an aquifer was not present along the western RRLF boundary at soil borings SB-16-01 and SB-16-02 (see **Figure 3**); therefore no monitoring wells were set at those locations. Consequently, wells are located on the perimeter of the landfill where the uppermost aquifer is present. Given the presence of the natural clay-rich till hydraulic barrier and the no-flow boundary to the west, the horizontal spacing of the wells is adequate to detect constituents from the CCR unit.

Monitoring wells were constructed within each borehole where an aquifer was encountered using 2-inch-diameter, Schedule 40 PVC casing and 5-foot long screens with 0.010-inch factory cut slots. Monitoring well construction diagrams from the installed monitoring wells accompany the soil boring logs in Appendix A. Following well installation, the grout and bentonite seal materials were allowed to stabilize for more than 24-hours before monitoring well development began.

3.1.3 Monitoring Well Development and Surveying

Following installation, each CCR monitoring well was developed by air lifting methods. In addition, a Michigan-licensed surveyor horizontally located each monitoring well utilizing the Michigan State Plan South Zone-2113, North American Datum 1983, International feet. Vertical elevations of the ground surface at each soil boring and monitoring well location and the top of casing for each monitoring well were also surveyed in feet relative to the North American Vertical Datum of 1988 (NAVD 88). Monitoring well and soil boring coordinates, elevations, screened intervals, and other monitoring well details are summarized in Table 1.

3.1.4 Detection Monitoring

The monitoring wells in the RRLF groundwater monitoring system, as shown on **Figure 2**, and described in Section 3, will serve as the detection monitoring locations pursuant to Title 40 CFR §257.93 and §257.94 of the CCR Rule. Because the uppermost aquifer is not uniformly present across the site, there are no apparent hydraulically upgradient wells, and the uppermost aquifer where present is isolated by a laterally contiguous silty-clay unit that significantly impedes vertical groundwater flow thus preventing the uppermost aquifer from potentially being affected by CCR, monitoring of the RRLF CCR unit using inter well statistical methods (upgradient to downgradient) is not likely appropriate. Instead, based on these hydrogeologic conditions, intra-well statistical approaches are likely a more appropriate method to evaluate groundwater data statistically. Consequently, intra-well statistical tests will be evaluated for use during detection monitoring. Using the data collected from the monitoring well system, a statistical evaluation plan is being developed to evaluate compliance with the CCR Rules.

Section 4
Groundwater Monitoring System Certification

Groundwater Monitoring System Certification per 40 CFR §257.91(f)
Range Road Landfill
China Township, Michigan

The U.S. EPA's Disposal of Coal Combustion Residuals from Electric Utilities Final Rule Title 40 CFR Part 257 §257.91 requires that the owner or operator of an existing CCR unit install a groundwater monitoring system. The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of Title 40 CFR §257.91.

CERTIFICATION

I hereby certify that the groundwater monitoring system presented within this document for the RRLF CCR unit has been designed and constructed to meet the requirements of Title 40 CFR §257.91 of the Federal CCR Rule. This document is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of Title 40 CFR §257.91.

Name	Expiration Date	
David B. McKenzie, P.E.	October 31, 2017	
Company	Date	
TRC Engineers Michigan, Inc.	October 13, 2017	Stamp

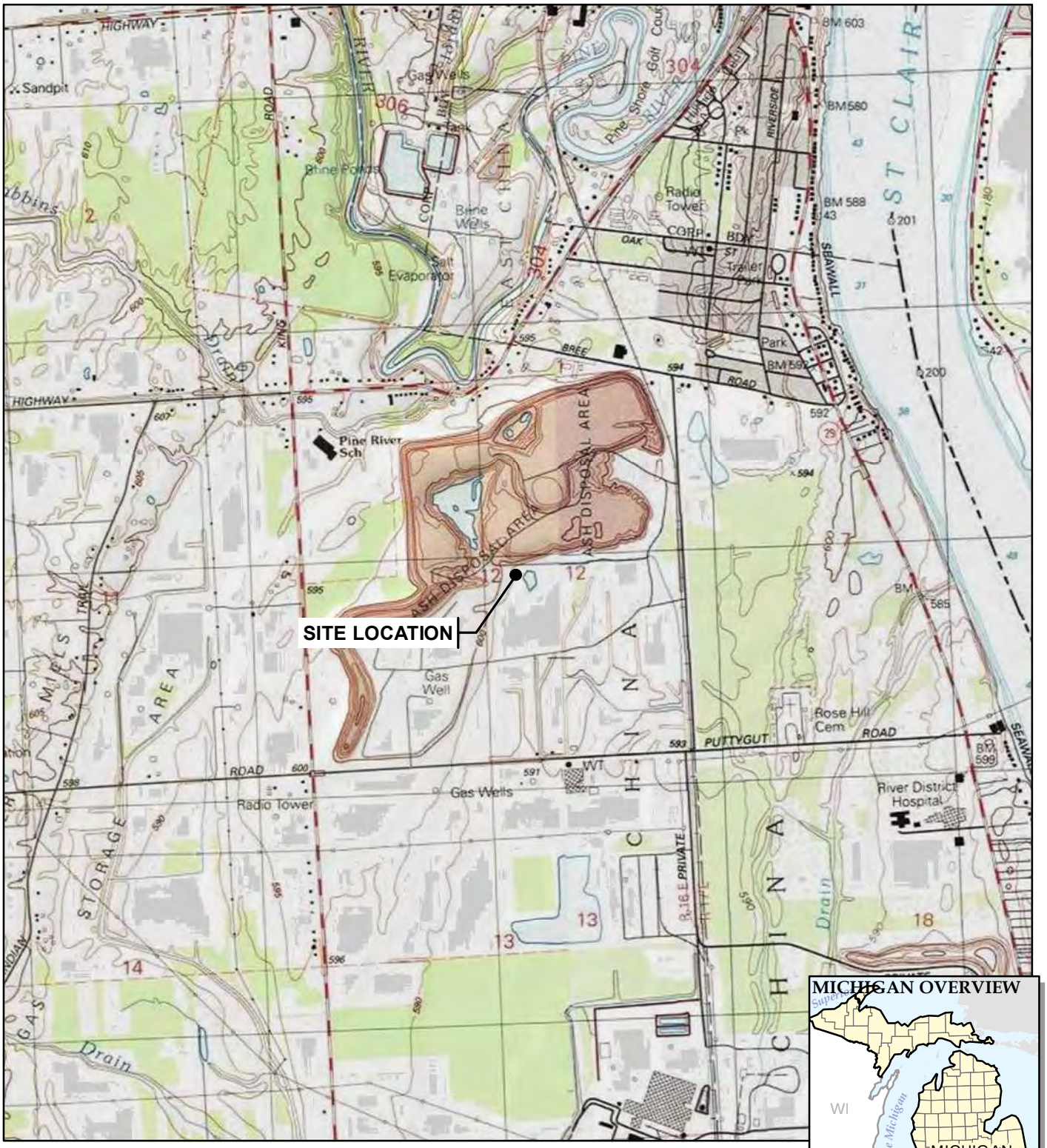
Tables

Table 1
Monitoring Well Information Summary
DTE Electric Company – Range Road Landfill
China Township, Michigan

Well Location	Date Installed	Northing	Easting	Ground Surface Elevation (ft AMSL)	TOC Elevation (ft AMSL)	Geologic Unit of Screen Interval	Well Construction	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft AMSL)	Borehole Terminus Depth (ft BGS)	Borehole Terminus Elevation (ft AMSL)
Range Road Landfill											
MW-16-01	1/13/2016	476209.00	13624821.72	592.70	595.35	Sand with Silt	2" PVC	202.0 to 207.0	390.7 to 385.7	220.0	372.7
MW-16-02	1/27/2016	477637.97	13625568.11	595.33	598.44	Silty Sand with Gravel at 201.5-205 ft bgs, and Silty Sand at 205-206.5 ft bgs.	2" PVC	201.5 to 206.5	393.8 to 388.8	220.0	375.3
MW-16-03	2/1/2016	479235.69	13625828.80	595.07	597.69	Silty Gravel with Sand	2" PVC	163.0 to 168.0	432.1 to 427.1	180.0	415.1
MW-16-04	5/24/2016	480290.88	13625442.17	594.07	596.87	Silty Sand	2" PVC	180.0 to 185.0	414.1 to 409.1	210.0	384.1
MW-16-05	5/13/2016	474831.74	13622242.26	599.62	601.97	Gravel with Sand	2" PVC	123.0 to 128.0	476.6 to 471.6	140.0	459.6
MW-16-06	5/10/2016	479837.91	13623393.48	598.00	600.68	Sand	2" PVC	90.0 to 95.0	508.0 to 503.0	140.0	458.0
MW-16-07	5/13/2016	474892.80	13623511.65	589.40	589.34	Sand	2" PVC	95.0 to 100.0	494.4 to 489.4	140.0	449.4

Notes:
Coordinates are Michigan State Plane South Zone-2113, International Feet.
Elevation in feet above NAVD88.
TOC: Top of well casing.
ft AMSL: Feet above mean sea level.
ft BGS: Feet below ground surface.

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000
FEET

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080
TRC - GIS

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
3600 RANGE ROAD EAST
CHINA TOWNSHIP, MICHIGAN

TITLE:
SITE LOCATION MAP

DRAWN BY:	J PAPEZ
CHECKED BY:	S HOLMSTROM
APPROVED BY:	V BUENING
DATE:	OCTOBER 2017
PROJ. NO.:	265996.0000
FILE:	265996-001slmMB.mxd

FIGURE 1

E:\DTE\CCR_Sites\2017_265996\265996-001slmMB.mxd -- Saved By: BDEEGAN on 10/9/2017, 14:37:13 PM

LEGEND

- MONITORING WELL
- SOIL BORING
- APPROXIMATE ANTICIPATED MAXIMUM LIMIT OF ASH FILL
- OIL/GAS WELL LOCATION

NOTES

1. BASE MAP IMAGERY FROM ST. CLAIR COUNTY INFORMATION TECHNOLOGY DEPARTMENT WEBMAP, 2015.
2. WELL LOCATIONS SURVEYED IN MARCH AND MAY 2016 BY BMJ ENGINEERS & SURVEYORS, INC.
3. OIL AND GAS WELL LOCATIONS FROM MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, GEOWEBFACE.

N

0 600 1,200 Feet

1 " = 600 '

1:7,200

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
3600 RANGE ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:
MONITORING NETWORK AND SITE PLAN

DRAWN BY:	J. PAPEZ	PROJ NO.:	265996.0000
CHECKED BY:	S HOLMSTROM		**FIGURE 2**
APPROVED BY:	V. BUENING		
DATE:	OCTOBER 2017		

TRC
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FILE NO.: 265996-0000-002.mxd

Plot Date: 10/12/2017, 09:21:55 AM by BDEEGAN -- LAYOUT: ANSI B(11"x17")
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Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

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TRC - GIS

Plot Date: 10/9/2017, 14:24:54 PM by BDEEGAN -- LAYOUT: ANSI B(11"x17")
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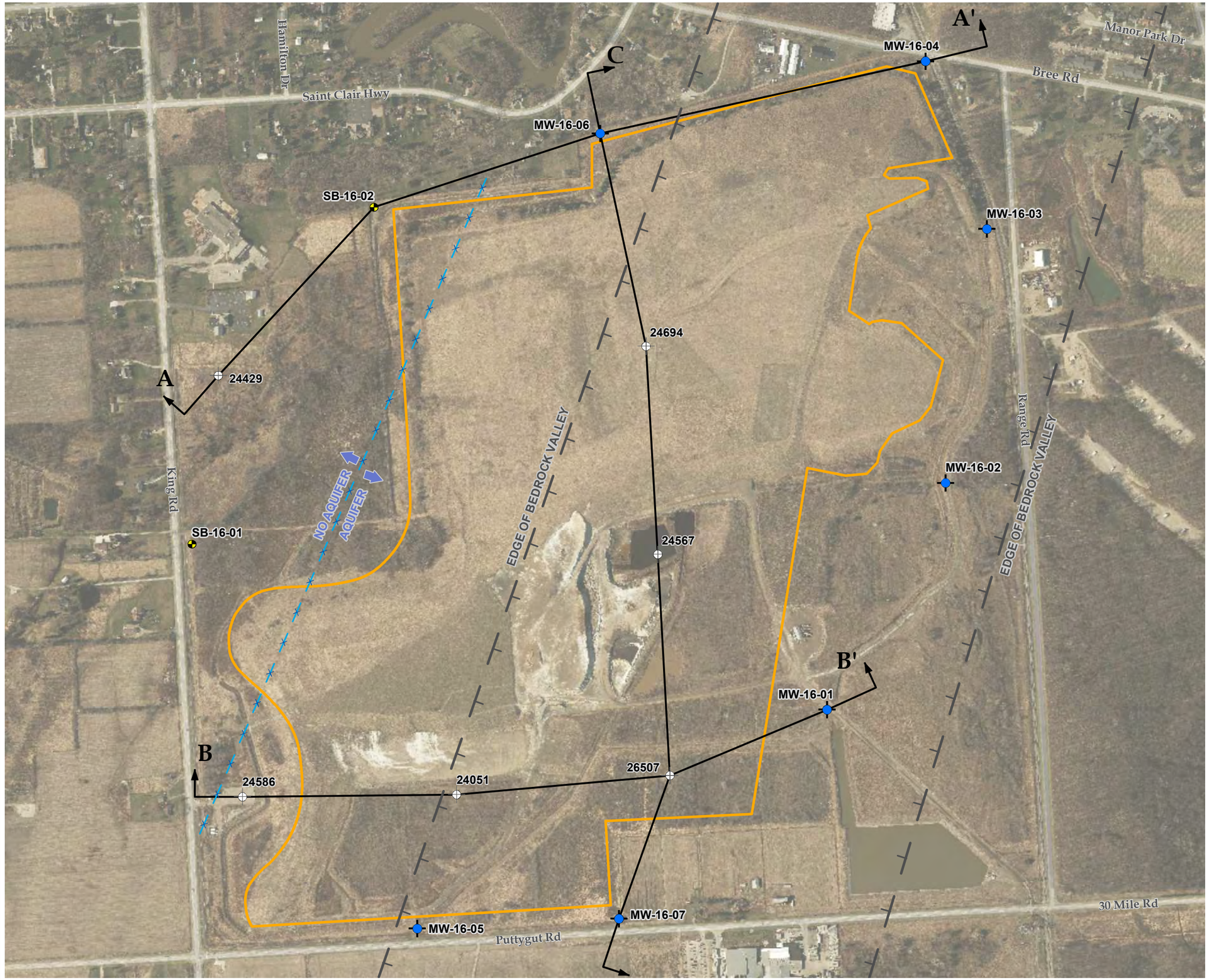

LEGEND

- MONITORING WELL
- SOIL BORING
- APPROXIMATE ANTICIPATED MAXIMUM LIMIT OF ASH FILL
- OIL/GAS WELL LOCATION
- CROSS SECTION LINES
- APPROXIMATE AQUIFER BOUNDARY
- APPROXIMATE EDGE OF BEDROCK VALLEY

NOTES

1. BASE MAP IMAGERY FROM ST. CLAIR COUNTY INFORMATION TECHNOLOGY DEPARTMENT WEBMAP, 2015.
2. WELL LOCATIONS SURVEYED IN MARCH AND MAY 2016 BY BMJ ENGINEERS & SURVEYORS, INC.
3. OIL AND GAS WELL LOCATIONS FROM MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, GEOWEBFACE.

N

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
3600 RANGE ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:
CROSS SECTION LOCATOR MAP

DRAWN BY:	J. PAPEZ	PROJ NO.:	265996.0000
CHECKED BY:	S HOLMSTROM		
APPROVED BY:	V BUENING		**FIGURE 3**
DATE:	OCTOBER 2017		

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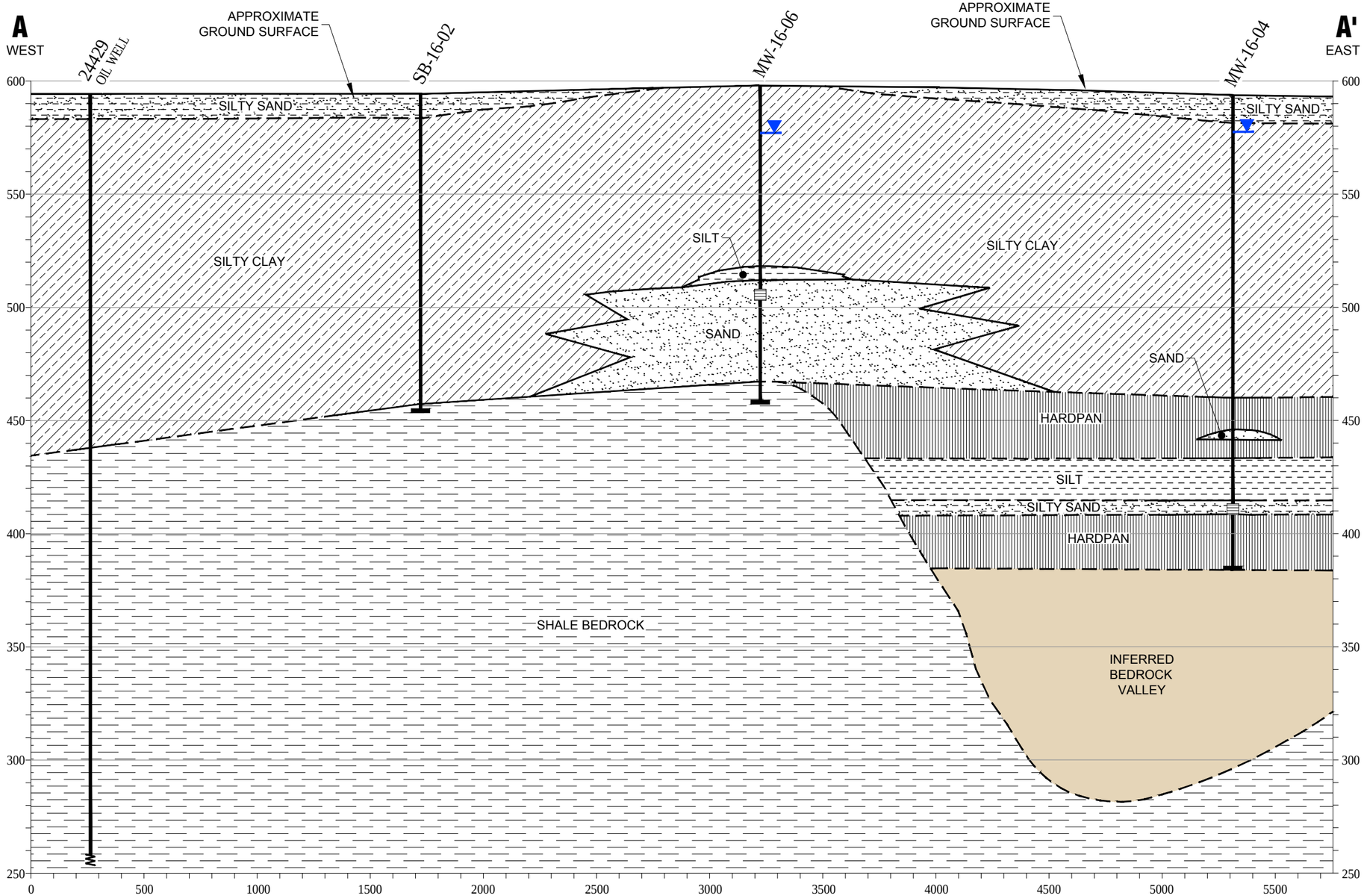
FILE NO.: 265996-0000-003.mxd

GENERALIZED GEOLOGIC CROSS-SECTION A-A'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILT
- HARDPAN
- SILTY SAND
- SILTY CLAY
- SAND
- SHALE BEDROCK
- UNCONSOLIDATED BEDROCK VALLEY FILL

SCALE IN FEET
VERTICAL: 50 to 0
HORIZONTAL: 0 to 500

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
CHINA TOWNSHIP, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS-SECTION A-A'

DRAWN BY:	D.STEHLE	PROJ NO.:	265996.0000
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 4**
DATE:	SEPTEMBER 2017		

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FILE NO.: 265996.0000.04-06.dwg

11x17 --- ATTACHED XREFS: --- ATTACHED IMAGES:
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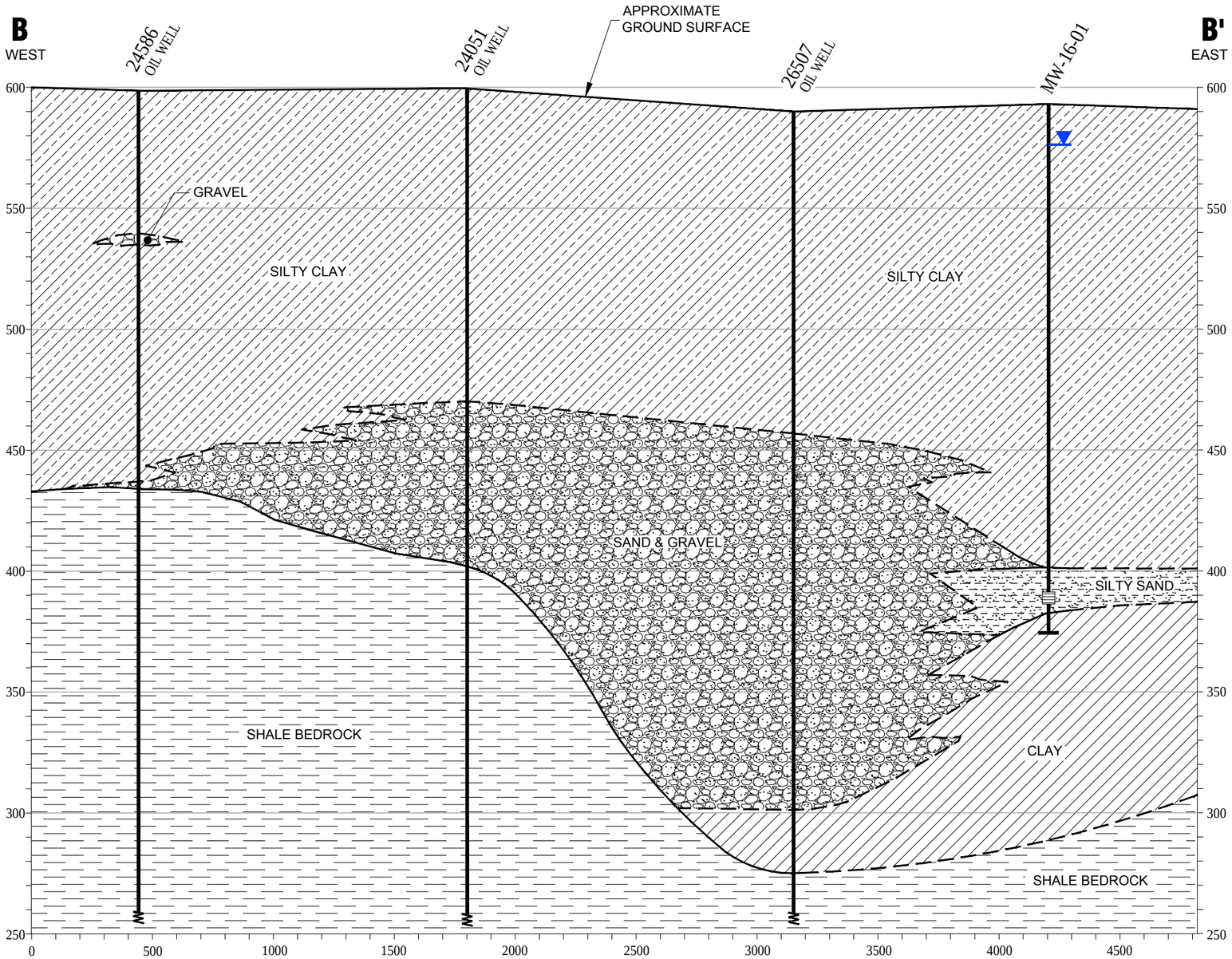
GENERALIZED GEOLOGIC CROSS-SECTION B-B'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- GRAVEL
- SAND & GRAVEL
- SILTY SAND
- CLAY
- SHALE BEDROCK

SCALE IN FEET
VERTICAL: 0 – 50
HORIZONTAL: 0 – 500

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
CHINA TOWNSHIP, MICHIGAN

TITLE:
GENERALIZED GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	D.STEHLE	PROJ NO.:	265996.0000
CHECKED BY:	S.HOLMSTROM		
APPROVED BY:	V.BUENING		**FIGURE 5**
DATE:	SEPTEMBER 2017		

TRC
1540 Eisenhower Place
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Phone: 734.971.7080
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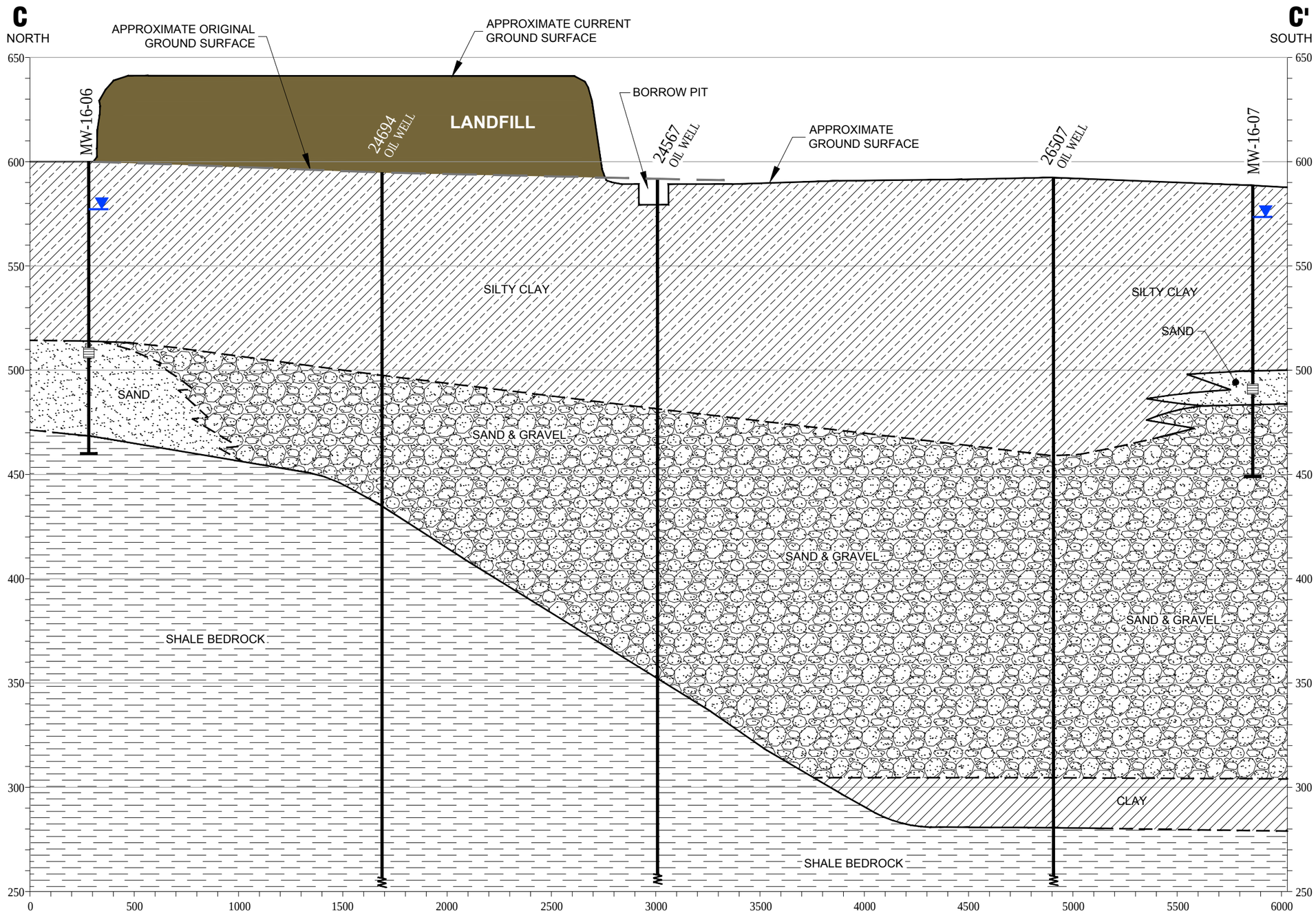
FILE NO.: 265996.0000.04-06.dwg

11x17 --- ATTACHED XREF'S; --- ATTACHED IMAGES;
DRAWING NAME: \\ntapa-annarbor\aam-vol2\CADD\PJT\000_TRC\DTE\East China\Range Road LF\265996\0000\265996.0000.04-06.dwg --- PLOT DATE: October 12, 2017 - 5:28AM --- LAYOUT: FIG05 XS BB

GENERALIZED GEOLOGIC CROSS-SECTION C-C'



LEGEND

- STRATEGRAPHIC BOUNDARY (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION
- SOIL BORING
- WELL SCREEN INTERVAL
- END OF BORING

Lithology Key

- SILTY CLAY
- SAND
- SAND & GRAVEL
- SILTY SAND
- CLAY
- SHALE BEDROCK

SCALE IN FEET
VERTICAL 50 0
HORIZONTAL 0 500

PROJECT:	DTE ELECTRIC COMPANY RANGE ROAD LANDFILL CHINA TOWNSHIP, MICHIGAN
TITLE:	GENERALIZED GEOLOGIC CROSS-SECTION C-C'
DRAWN BY:	D.STEHLE
CHECKED BY:	S.HOLMSTROM
APPROVED BY:	V.BUENING
DATE:	SEPTEMBER 2017
PROJ NO.:	265996.0000
	FIGURE 6

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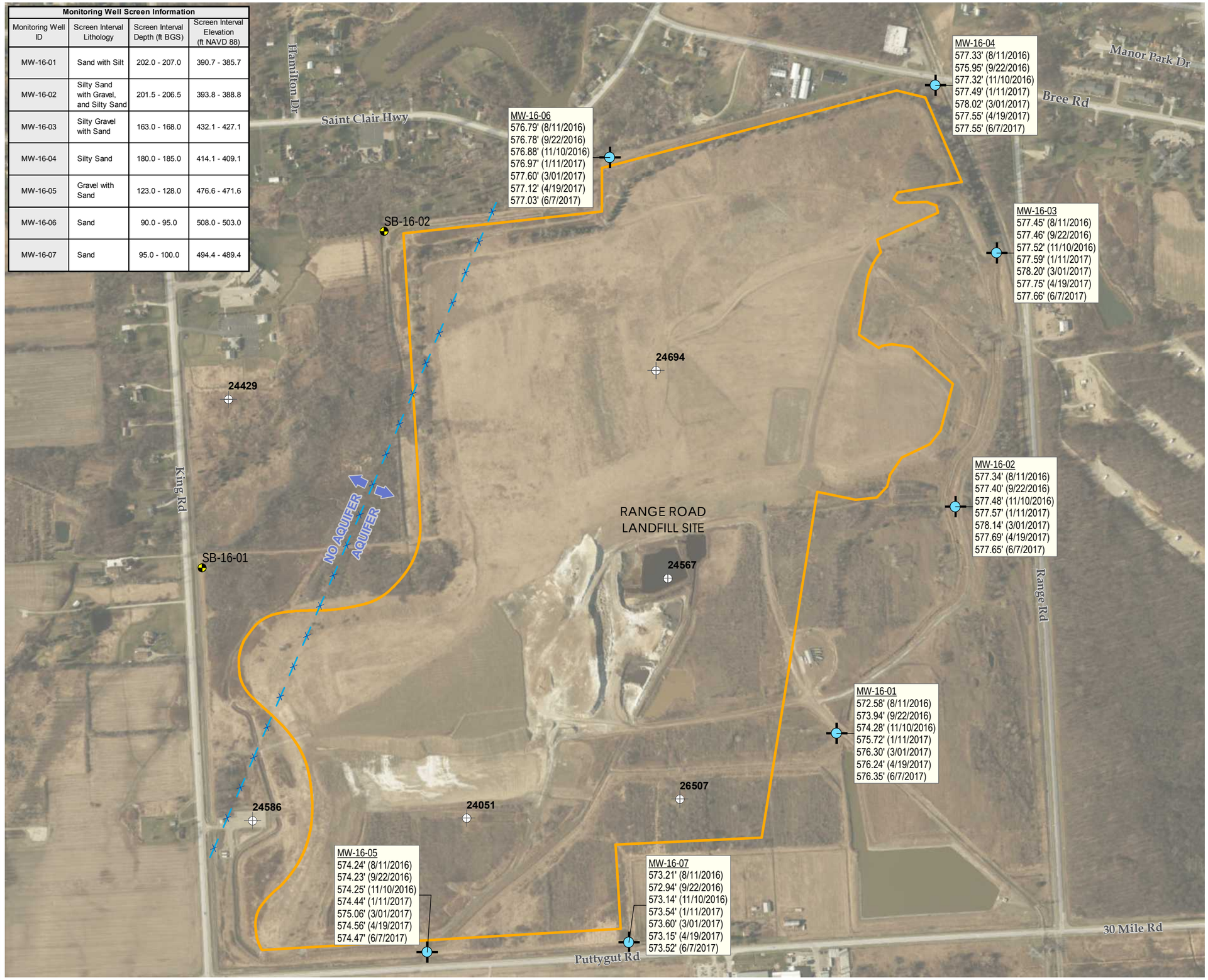
FILE NO.: 265996.0000.04-06.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: \\ntapa-annarbor\aam-vol2\CADD\PJT\00_TRC\DTE\East China\Range Road LF\265996\0000\ 265996.0000.04-06.dwg --- PLOT DATE: October 12, 2017 - 5:28AM --- LAYOUT: FIG06 XS CC

TRC - GIS

Monitoring Well Screen Information			
Monitoring Well ID	Screen Interval Lithology	Screen Interval Depth (ft BGS)	Screen Interval Elevation (ft NAVD 88)
MW-16-01	Sand with Silt	202.0 - 207.0	390.7 - 385.7
MW-16-02	Silty Sand with Gravel, and Silty Sand	201.5 - 206.5	393.8 - 388.8
MW-16-03	Silty Gravel with Sand	163.0 - 168.0	432.1 - 427.1
MW-16-04	Silty Sand	180.0 - 185.0	414.1 - 409.1
MW-16-05	Gravel with Sand	123.0 - 128.0	476.6 - 471.6
MW-16-06	Sand	90.0 - 95.0	508.0 - 503.0
MW-16-07	Sand	95.0 - 100.0	494.4 - 489.4



LEGEND

- MONITORING WELL
- SOIL BORING
- APPROXIMATE ANTICIPATED MAXIMUM LIMIT OF ASH FILL
- APPROXIMATE AQUIFER BOUNDARY
- OIL/GAS WELL LOCATION

MW ID
GROUNDWATER ELEVATION (DATE)
GROUNDWATER ELEVATION (DATE)
etc...

FT BGS
FEET BELOW GROUND SURFACE
FT NAVD 88
FEET RELATIVE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED IN MARCH AND MAY 2016 BY BMJ ENGINEERS & SURVEYORS, INC.
3. OIL AND GAS WELL LOCATIONS FROM MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, GEOWEBFACE.
4. GROUNDWATER ELEVATIONS DISPLAYED IN FEET ABOVE MEAN SEA LEVEL.

0 600 1,200 Feet

1 " = 600 '
1:7,200

PROJECT:
DTE ELECTRIC COMPANY
RANGE ROAD LANDFILL
3600 RANGE ROAD
CHINA TOWNSHIP, MICHIGAN

TITLE:
GROUNDWATER POTENTIOMETRIC ELEVATION SUMMARY

DRAWN BY:	B DEEGAN	PROJ NO.:	265996.0000
CHECKED BY:	S HOLMSTROM		
APPROVED BY:	V BUENING		**FIGURE 7**
DATE:	OCTOBER 2017		

TRC
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FILE NO.: 265996-0000-001.mxd

Plot Date: 10/9/2017, 14:46:09 PM by BDEEGAN -- LAYOUT: ANSI B (11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0000-001.mxd
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Appendix A
Soil Boring and Monitoring Well Installation Logs

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	1/5/16	1/13/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	592.70	595.35	220.0	6

Boring Location: 157' NW of water filling station, 10' SW of main drive.

Personnel
Logged By - C. Scieszka
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
East China	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time 2/3/16 16:16 ▼ Depth (ft bgs) 12.94

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	50		5	**SILTY SAND** mostly fine to medium sand, some silt, dark brown (10YR 3/3), moist, dense, roots present.	SM			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				SILTY CLAY mostly clay, some silt, low to medium plasticity, dark grayish brown (10YR 4/2), mottled with yellowish brown (10YR 5/6), dry, very stiff, roots present.	CL-ML			
2 CS	75		10	**CLAY** mostly clay, trace silt, medium to high plasticity, gray (10YR 5/1) mottled with yellowish brown (10YR 5/6), dry, very stiff. Change to trace medium to coarse sand at 10.5 feet. ▼				
3 CS	90		15	Change to high plasticity, gray (10YR 5/1), moist, very soft at 15.5 feet.				
			20					
			25		CL			
4 CS	50		30	Change to no sand at 30.0 feet.				
			35					
5			40					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

Checked By: M. Powers

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
CS	50			**CLAY** mostly clay, trace silt, high plasticity, gray (10YR 5/1), moist, very soft.				
6 ST	100		50					
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					

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	70		105	**CLAY** mostly clay, trace coarse gravel, trace coarse sand, trace silt, high plasticity, gray (10YR 5/1), moist, stiff.				
			110					
13 CS	100		115					
			120		CL			
			125					
14 CS	50		130					4-inch sample rods sank under weight of casing due to soft clay from 130 feet to 142 feet when cased off to 130 feet with 6-inch casing rods.
			135					
			140	Change to few fine to coarse sand, trace fine to coarse gravel at 140.0 feet.				
15 CS	100		145	**SILT** mostly silt, non-plastic, dark gray (10YR 4/1), moist, medium stiff to stiff.	ML			
16 CS	100			**SAND** mostly fine sand, trace silt, dark gray (10YR 4/1), moist, medium dense to dense.	SP			
			150	**CLAY** mostly clay, trace fine to coarse gravel, trace fine to coarse sand, low plasticity, dark gray (10YR 4/1), dry, hard.				
17 CS	100		155		CL			
			160	Change to few fine to coarse gravel at 160.0 feet.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
18 CS	100		165	**CLAY** mostly clay, few fine to coarse gravel, trace fine to coarse sand, low plasticity, dark gray (10YR 4/1), dry, hard.				
			170					
19 CS	100		175		CL			
			180					
20 CS	100							
			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			
21 CS	50		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.	SW CL			
22 CS	100		195	**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. **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		200 205	**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			
			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			
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.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

Facility/Project Name	Date Drilling Started	Date Drilling Completed	Project Number
DTE Electric Company Range Road Landfill	1/14/16	1/20/16	231828.0000.0000

Drilling Firm	Drilling Method	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	595.33	598.44	220.0	6

Boring Location: 375' N of SG-07, 10' W of drive, S of Range Rd. gate.

Personnel
Logged By - C. Scieszka
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village	County	State
East China	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time 2/8/16 13:24 ▼ Depth (ft bgs) 17.53

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	60		0–5	**CLAYEY SAND** mostly fine to medium sand, some clay, few silt, trace fine to coarse gravel, brown (10YR 4/3), moist, dense.	SC			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			5–10	**SILTY CLAY WITH SAND** mostly clay, some silt, few to little fine to medium sand, low plasticity, gray (10YR 5/1), moist, very stiff.	CL-ML			Original soil boring abandoned due to broken rods lost in boring at approximately 210 feet below ground surface. Redrilled and installed well at survey location noted above, lithology from 0 to 160 feet taken from original boring approximately 20 feet south of MW-16-02.
2 CS	60		10–15	**SAND** mostly fine to medium sand, few silt, yellowish brown (10YR 5/6), moist, loose. Change to dark gray (10YR 4/1) at 9.0 feet.	SP			
			15–20	**CLAY** mostly clay, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard. ▼ Change to trace fine gravel, no sand, moist, very soft at 20.0 feet.				
3 CS	80		20–25					
			25–30					
4 CS	100		30–35	Change to no gravel at 30.0 feet.	CL			
			35–40					
5 CS	100		40–45	1-inch thick sand seam, mostly fine to coarse sand, trace coarse gravel, very dark gray (10YR 3/1), saturated, loose at 39.5 feet.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: Chris Scieszka

Checked By: M. Powers

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

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft.				
6 ST	100							
7 CS	100		55					
			60					
8 CS	100		65		CL			
			70					
9 CS	90		75					
			80	Change to trace fine gravel, trace fine to coarse sand, medium plastic, medium stiff at 78.5 feet.				
10 CS	80		85					
			90	**SILT** mostly silt, trace clay, trace to few fine sand, non-plastic, dark gray (10YR 4/1), dry, hard.	ML			
11 CS	90		95	**SILTY SAND** mostly fine sand, few medium sand, little to some silt, dark grayish brown (10YR 4/2), moist, dense.	SM			
			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.	CL			
12			105					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
CS	40		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			4-inch sample rods sank under weight of casing due to soft clay from 110 feet to 118 feet when cased off to 110 feet with 6-inch casing rods.
13 CS	0		120					118 to 120 feet sample likely fell out of rods during retrieval.
14 CS	100		125	**SILT** mostly silt, few fine sand, non plastic, dark gray (10YR 4/1), moist, medium stiff.	ML			
			130	**SILTY SAND** mostly fine sand, little silt, trace cobbles, trace fine to coarse gravel, dark gray (10YR 4/1), saturated, dense.	SM			
15 CS	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.	CL			
16 CS	70		145					
17 CS	80		155					
18 CS	100		165					
			170					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	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			
			180	**SAND WITH SILT** mostly fine to coarse sand, few to little silt, dark grayish brown (10YR 4/2), saturated, medium dense.	SW-SM			
20 CS	60		185	**CLAY** mostly clay, trace to few fine to coarse gravel, trace coarse sand, low plasticity, dark grayish brown (10YR 4/2), dry, hard.	CL			
			190					
21 CS	100		195	**SILTY SAND WITH GRAVEL** mostly fine to coarse sand, some silt, little fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, dense.	SM			
				SILTY SAND mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.	SM			
			200	**SAND** mostly fine to coarse sand, trace to few silt, dark grayish brown (10YR 4/2), saturated, loose.	SW			
				SILTY SAND mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.	SM			
22 CS	100		205	**SAND** mostly fine to coarse sand, trace to few silt, dark grayish brown (10YR 4/2), saturated, loose.	SW			
				SILTY SAND WITH GRAVEL mostly fine sand, some silt, little fine to coarse gravel, dark grayish brown (10YR 4/2), saturated, dense.	SM			
			210	**SILTY SAND** mostly fine sand, some silt, dark grayish brown (10YR 4/2), saturated, dense.	ML			
				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.	GW-GM			
23 CS	100		215	**GRAVEL WITH SILT AND SAND** mostly fine to coarse gravel, few to little fine to coarse sand, few to little silt, dark gray (10YR 4/1), saturated, loose.	SW			
				SAND WITH GRAVEL mostly fine to coarse sand, little fine to coarse gravel, trace to few silt, dark gray (10YR 4/1), saturated, loose.	SP			
			220	**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.				
			225	End of boring at 220.0 feet below ground surface.				
			230					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	1/28/16	2/1/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	595.07	597.69	180.0	6/4

Boring Location: 32' W of E fence, 420' N of PZ-2, N of Range Rd. gate.	Personnel: Logged By - C. Scieszka; Driller - A. Goldsmith	Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations: While Drilling: Date/Time; After Drilling: Date/Time 2/8/16 13:34 ▼ Depth (ft bgs) 17.08
East China	St. Clair	MI	

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	90		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.	CL			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
				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.	CL			
			5	**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.	CL			
				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.	SP			
2 CS	90		10	**CLAY** mostly clay, trace fine gravel, trace coarse sand, high plasticity, dark gray (10YR 4/1), dry to moist, hard.				
			15	▼				
			20	Change to soft at 21.0 feet.				
3 CS	100		25	Change to very soft at 25.0 feet.	CL			
			30					
4 CS	100		35					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: Chris Scieszka

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

Checked By: M. Powers

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

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

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	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.				
12 CS	100		100	Change to stiff at 102.0 feet.				
13 CS	70		105					
			110					
			115		CL			
14 CS	100		120					
			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.	ML			
16 CS	100		145	**CLAY** mostly clay, trace fine to coarse gravel, high plasticity, dark gray (10YR 4/1), saturated, very soft.	CL			

WELL CONSTRUCTION LOG

WELL NO. MW-16-03

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	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			
			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.	CL			
18 CS	100		165	**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			
			170					
19 CS	100		175	**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			
			180	End of boring at 180.0 feet below ground surface.				
			185					
			190					
			195					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-04

Facility/Project Name	Date Drilling Started	Date Drilling Completed	Project Number
DTE Electric Company Range Road Landfill	5/18/16	5/24/16	231828.0000.0000

Drilling Firm	Drilling Method	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	596.87	594.07	210.0	6

Boring Location: NE of landfill, inside perimeter fence, near railroad crossing on Bree Rd.
N: 480291.59 E: 13625442.43

Personnel
Logged By - C. DoVono/J. Reed
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village	County	State
East China	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time 5/25/16 09:15 ▼ Depth (ft bgs) 19.11

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	65		5	**SILTY SAND** mostly sand, little to some silt, brown (10YR 4/3), moist, medium dense.	SM			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10	**SAND** mostly fine to medium sand, brown (10YR 4/3), moist, loose.	SP			
2 CS	70		15	**CLAY** mostly clay, few silt, medium plasticity, dark gray (10YR 4/1), moist, stiff. ▼				
3 CS	0		25					
			30	Change to high plasticity at 30.0 feet.	CL			
4 CS	100		35	Change to soft at 34.5 feet.				
			40					
5 CS	100		45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

Checked By: C. Scieszka

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	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					
9 CS	100		85					
			90					
10 CS	85		95	Change to medium stiff at 94.5 feet.				
			100					
11 CS	100		105	Change to stiff at 103.0 feet.				

WELL CONSTRUCTION LOG

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			110	**CLAY** mostly clay, few silt, trace sand, high plasticity, dark gray, moist, stiff.				
12 CS	90		115					
			120		CL			
13 CS	55		125	Change to very soft at 123.0 feet.				
			130					
14 CS	100		135	**SILTY CLAY** mostly clay, some silt, little gravel, dry, hard, hardpan.				
			140		CL-ML			
15 CS	100		145					
			150	**SAND** mostly fine to medium sand, gray (10YR 5/1), moist.	SP			
				SILTY SAND WITH GRAVEL little gravel, gray (10YR 5/1), moist, very dense, hardpan.				
16 CS	100		155		SM			
			160	**SILT** mostly silt, trace to few fine sand, trace gravel, gray (10YR 5/1), moist.				
17 CS	80		165		ML			
			170	Change to dry to moist at 170.0 feet.				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-04

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL 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.				
			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.				
			215					
			220					
			225					
			230					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-05

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	5/12/16	5/13/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	601.97	599.62	140.0	6

Boring Location: SW of landfill, near Puttygut Rd. gate closest to King Rd.

N: 474831.30 E: 13622242.19

Personnel
Logged By - C. DoVono
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
East China	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time 5/18/16 11:40 ▼ Depth (ft bgs) 25.67

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	50		5	**SILTY CLAY** mostly clay, little to some silt, brown (10YR 4/3), moist, stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	70		10	**CLAY** mostly clay, dark gray (10YR 4/1), moist, stiff.				
3 CS	70		15					
			20	Change to medium to high plasticity, soft at 20.0 feet.				
				Change to stiff at 22.0 feet.				
			25 ▼		CL			
4 CS	70		30	Change to soft at 30.0 feet.				
			35					
			40	Change to dark grayish brown (10YR 4/2) at 40.0 feet.				
5 CS	100		45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

WELL NO. MW-16-05

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50	**CLAY** mostly clay, medium to high plasticity, dark grayish brown (10YR 4/2), moist, soft.	CL			
				SILTY SAND mostly sand, little to some silt, trace gravel.	SM			
				CLAY mostly clay, medium to high plasticity, dark grayish brown (10YR 4/2), moist, soft.				
6 CS	70		55					
			60					
7 CS	100		65					
			70	Change to very dark gray (10YR 3/1) at 70.0 feet.				
8 CS	90		75					
			80	Change to dark gray (10YR 4/1), wet at 80.0 feet.	CL			
9 CS	80		85	Change to stiff at 87.0 feet.				
			90	Change to moist, high plasticity at 90.0 feet.				
10 CS	80		95					
			100	Change to medium plasticity at 100.0 feet.				
11 CS	100		105					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-05

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			110	**CLAY** mostly clay, medium plasticity, dark gray (10YR 4/1), moist, stiff. Change to very soft, high plasticity at 110.0 feet.				
12 CS	100		115		CL			
			120	**GRAVEL WITH SAND** mostly fine to coarse gravel, little medium to coarse sand, trace cobble, brown (10YR 4/3), saturated.				
13 CS	100		125					
			130		GW			
14 CS	100		135					
			140	End of boring at 140.0 feet below ground surface.				
			145					
			150					
			155					
			160					
			165					
			170					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

TRC

WELL NO. MW-16-06

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	5/2/16	5/10/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	598.00	600.68	140.0	6

Boring Location: N of landfill, approximately 20 feet S of N fence, approximately 100 feet E of jog in N fence.
N: 479837.91 E: 13623393.48

Personnel
Logged By - J. Reed/C. Scieszka
Driller - A. Goldsmith

Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:
East China	St. Clair	MI

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time 6/9/16 14:22 ▼ Depth (ft bgs) 21.14

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	100		5	**SILTY CLAY** mostly clay, little to some silt, trace to few fine to medium sand, low plasticity, dark gray (10YR 4/1), moist, medium stiff.	CL-ML			Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	10		10					
			15					
			20 ▼					
3 CS	100		25					
			30					
4 CS	100		35					
			40	Change to trace fine to medium sand at 40.0 feet				
5 CS	100		45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

WELL NO. MW-16-06

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	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.	CL-ML			
6 CS	100		55					
7 CS	100		60					
8 CS	100		65					
9 CS	100		70					
10 CS	100		75					
11 CS	60		80	**SILT** mostly silt, trace fine sand, non plastic, dark gray (10YR 4/1), moist, stiff.	ML			
			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.	SP			
			90	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.				
			95	Change to mostly fine sand, no gravel at 97.0 feet.				
			100	Change to trace silt at 99.5 feet. Change to mostly medium to coarse sand, few fine to coarse gravel at 100.0 feet.				
			105					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-06

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
12 CS	100		110–115	**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.	SP			
13 CS	100		120–125					
14 CS	100		130–135	**SHALE** dark gray (10YR 4/1), dry, brittle.				
			140	End of boring at 140.0 feet below ground surface.				
			145–170					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-07

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	5/11/16	5/12/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	589.40	589.34	140.0	6

Boring Location: S of landfill, near former weather station.	Personnel	Drilling Equipment:
N: 474892.80 E: 13623511.65	Logged By - C. DoVono Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:		
East China	St. Clair	MI	While Drilling: Date/Time		Depth (ft bgs)
			After Drilling: Date/Time	5/18/16 09:30	Depth (ft bgs) 18.05

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
1 CS	40		0	**CLAY** mostly clay, dark grayish brown (10YR 4/2) with brown and gray mottling, moist, stiff.				Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			5	Change to dark gray (10YR 4/1), soft at 5.0 feet.				
			10					
			15					
			20	Change to wet at 20.0 feet.				
2 CS	100		25		CL			
			30					
3 CS	100		35					
			40	Change to very dark gray (10YR 3/1), moist at 39.0 feet.				
4 CS	100		45					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

Checked By: C. Scieszka

WELL CONSTRUCTION LOG

WELL NO. MW-16-07

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	COMMENTS
			50	**CLAY** mostly clay, very dark gray (10YR 3/1), moist, soft.	CL			
5 CS	75		55					
			60					
6 CS	100		65					
			70					
7 CS	100		75	Change to stiff at 76.0 feet.				
			80					
8 CS	100		85					
			90					
9 CS	100		95	**SILTY SAND** mostly sand, little to some silt, dark gray (10YR 4/2), moist to saturated.	SM			
				SAND mostly fine to medium sand, dark gray (10YR 4/1), saturated.				
			100	Change to mostly fine sand, gray (10YR 5/1) at 100.0 feet.	SP			
10 CS	90		105					

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

WELL CONSTRUCTION LOG

WELL NO. MW-16-07

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

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

BORING NO. SB-16-01

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	2/2/16	2/3/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	593.98	---	168.0	6

Boring Location:	Personnel	Drilling Equipment:
30' E of W fence, 85' S of N fence, on W side of landfill near King Rd. gate.	Logged By - C. Scieszka Driller - A. Goldsmith	TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations:		
East China	St. Clair	MI	While Drilling:	Date/Time	Depth (ft bgs)
			After Drilling:	Date/Time	Depth (ft bgs)

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
			0	**TOPSOIL** dark brown (10YR 3/3), moist, loose, roots.			
1 CS	50		5	**CLAY** mostly clay, trace fine to coarse gravel, trace fine to coarse sand, medium to high plasticity, dark gray (10YR 4/1) with brown mottles (10YR 4/3), dry, hard, roots. Change to no roots at 5.0 feet. Change to dark gray (10YR 4/1) at 7.5 feet.	CL		Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
2 CS	40		10	Change to no sand, no gravel, high plasticity, gray (10YR 5/1), moist at 10.0 feet. Change to soft at 15.0 feet.			
3 CS	100		20	Change to very soft at 20.0 feet.			
4 CS	100		25 30 35				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature: _____

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

Checked By: M. Powers

SOIL BORING LOG

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
			40	**CLAY** mostly clay, high plasticity, gray (10YR 5/1), moist, very soft.	CL		
5 CS	90		45				
6 ST	100		50				
7 CS	80		55				
			60				
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				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
			90	**CLAY** mostly clay, high plasticity, dark gray (10YR 4/1), moist, very soft. Change to stiff at 89.0 feet.	CL		
11 CS	100		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.			
12 CS	60		100	Change to no sand, no gravel, stiff at 100.0 feet			
13 CS	70		105 110 115				
14 CS	100		120 125				
			130	Change to trace to few fine to coarse sand at 130.0 feet.			

SOIL BORING LOG

BORING NO. SB-16-01

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	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		
			140				
16 CS	100		145	Change to few fine to coarse sand, few fine to coarse gravel, hard at 147.5 feet.			
			150	**SHALE** dark gray (10YR 4/1), layered, brittle, weathered.			
17 CS	100		155				
			160				
18 CS	100		165				
				End of boring at 168.0 feet below ground surface.			
			170				
			175				
			180				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

TRC

BORING NO. SB-16-02

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
DTE Electric Company Range Road Landfill	2/5/16	2/9/16	231828.0000.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Stock Drilling	Sonic	593.55	---	140.0	6

Boring Location: 30' E of W fence, 35' S of N fence, in NW corner of landfill.	Personnel: Logged By - C. Scieszka; Driller - A. Goldsmith	Drilling Equipment: TSi 150cc

Civil Town/City/or Village:	County:	State:	Water Level Observations: While Drilling: Date/Time Depth (ft bgs); After Drilling: Date/Time Depth (ft bgs)
East China	St. Clair	MI	

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
1 CS	50		5	**SILTY SAND** mostly fine to medium sand, little to some silt, dark yellowish brown (10YR 4/4), moist, medium dense, roots. Change to no roots at 2.5 feet. Change to dense, brown (10YR 4/3) mottled with yellowish brown (10YR 5/8) at 7.0 feet.	SM		Continuous sampling with 4-inch diameter casing from ground surface to terminus of soil boring, over-drilled with 6-inch diameter casing to install monitoring well.
			10	**SAND** mostly fine sand, trace to few silt, trace fine gravel, brown (10YR 4/3), saturated, medium dense.	SP		
2 CS	100		15	**CLAY** mostly clay, trace fine to coarse sand, trace fine to coarse gravel, medium plasticity, gray (10YR 5/1), moist, hard. Change to high plasticity, stiff at 15.0 feet.	CL		
3 CS	60		20 25	Change to very soft at 20.0 feet.			
4 CS	100		30 35 40				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

Signature:

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

Checked By: M. Powers

SAMPLE NUMBER AND TYPE	RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	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.			
			50	Change to no sand, no gravel at 50.0 feet.			
6 CS	100		55				
7 CS	100		60		CL		
8 CS	100		65				
			70				
			75	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.	ML		
			80	**SILTY SAND** mostly fine to medium sand, few to little silt, dark gray (10YR 4/1), saturated, dense.	SM		
9 CS	100			**CLAY** mostly clay, trace fine to coarse sand, high plasticity, gray (10YR 5/1), moist, very soft.	CL		
			85				
				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.	ML		
			90	**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.	CL		
10 CS	100		95				

SOIL BORING WELL CONSTRUCTION LOG 231828.0000.0000.GPJ TRC_CORP.GDT 7/14/16

SOIL BORING LOG

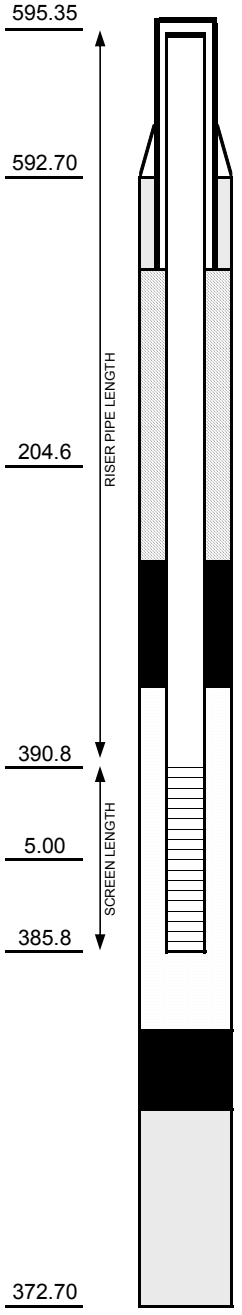
BORING NO. SB-16-02

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	COMMENTS
			100	**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.	SM		
				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.			
			105	Change to soft at 106.0 feet.			
11 CS	70		110				4-inch sample rods sank under weight of casing due to soft clay from 110 feet to 120 feet when cased off to 110 feet with 6-inch casing rods.
			115		CL		
12 CS	100		120				
			125				
			130				
13 CS	100		135				
				SHALE dark gray (10YR 4/1), dry, hard, weathered, not brittle.			
			140	Change to competent, layered at 139.5 feet.			
				End of boring at 140.0 feet below ground surface.			
			145				
			150				

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Range Road Landfill		WELL ID:	**MW-16-01**
PROJ. NO: 231828.0000	DATE INSTALLED: 1/13/2016 INSTALLED BY: C. Scieszka	CHECKED BY:	M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
595.35	2.7	TOP OF CASING
592.70	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
		GROUT/BACKFILL METHOD: TREMIE
204.6	192.5	GROUT
		BENTONITE SEAL MATERIAL: PELLETS
	195.0	BENTONITE SEAL
390.8	202.0	TOP OF SCREEN
5.00		FILTER PACK MATERIAL: MEDIUM, WASHED SAND
385.8	207.0	BOTTOM OF SCREEN
	207.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NATURAL COLLAPSE
372.70	220.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 220 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 1,700 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): SULFUR

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	209.80	T/PVC	2/3/2016	16:16
DTB AFTER DEVELOPING:	210.37	T/PVC	2/8/2016	13:16
SWL BEFORE DEVELOPING:	15.54	T/PVC	2/3/2016	16:16
SWL AFTER DEVELOPING:	66.59	T/PVC	2/8/2016	13:16
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Range Road Landfill			WELL ID: **MW-16-02**
PROJ. NO: 231828.0000	DATE INSTALLED: 1/27/2016	INSTALLED BY: C. Scieszka	CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
598.44	3.1	TOP OF CASING
595.33	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
		GROUT/BACKFILL METHOD: TREMIE
204.6	191.0	GROUT
		BENTONITE SEAL MATERIAL: PELLETS
	195.0	BENTONITE SEAL
393.8	201.5	TOP OF SCREEN
5.00		FILTER PACK MATERIAL: MEDIUM, WASHED SAND
388.8	206.5	BOTTOM OF SCREEN
	206.5	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NATURAL COLLAPSE
375.3	220.0	HOLE BOTTOM

RISER PIPE LENGTH

SCREEN LENGTH

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 220 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4.3 HOURS

WATER REMOVED: 1,290 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): SULFUR

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	210.25	T/PVC	2/4/2016	13:38
DTB AFTER DEVELOPING:	210.32	T/PVC	2/8/2016	13:24
SWL BEFORE DEVELOPING:	21.87	T/PVC	2/4/2016	13:38
SWL AFTER DEVELOPING:	20.53	T/PVC	2/8/2016	13:24
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	DTE Electric Company Range Road Landfill			WELL ID:	**MW-16-03**
PROJ. NO:	231828.0000	DATE INSTALLED: 2/1/2016	INSTALLED BY: C. Scieszka		CHECKED BY: M. Powers

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
597.69	2.6	TOP OF CASING
595.07	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
		GROUT/BACKFILL METHOD: TREMIE
165.6		RISER PIPE LENGTH
	154.0	GROUT
		BENTONITE SEAL MATERIAL: PELLETS
	157.0	BENTONITE SEAL
432.1	163.0	TOP OF SCREEN
5.00		SCREEN LENGTH
		FILTER PACK MATERIAL: MEDIUM, WASHED SAND
427.1	168.0	BOTTOM OF SCREEN
	168.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NATURAL COLLAPSE
415.1	180.0	HOLE BOTTOM

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 170 FT.
4 IN. FROM 170 TO 180 FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 1.75 HOURS

WATER REMOVED: 1,300 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: VERY TURBID

COLOR BEFORE: DARK GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	171.20	T/PVC	2/3/2016	16:46
DTB AFTER DEVELOPING:	171.18	T/PVC	2/8/2016	13:34
SWL BEFORE DEVELOPING:	19.68	T/PVC	2/3/2016	16:46
SWL AFTER DEVELOPING:	19.68	T/PVC	2/8/2016	13:34
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

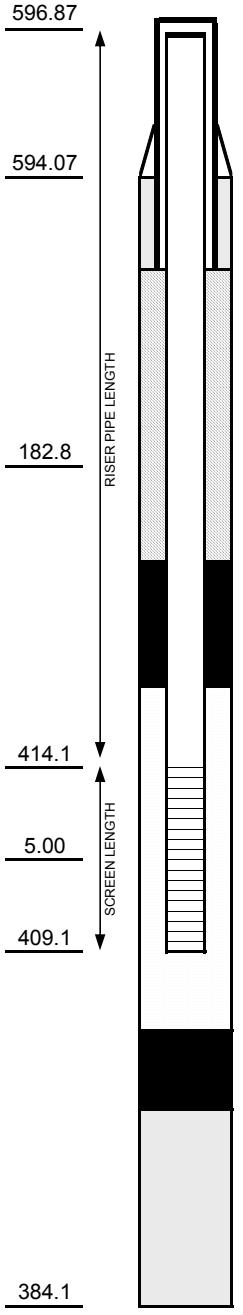
PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Range Road Landfill		WELL ID:	**MW-16-04**
PROJ. NO: 231828.0000	DATE INSTALLED: 5/24/2016 INSTALLED BY: J. REED	CHECKED BY:	C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
596.87	2.8	TOP OF CASING
594.07	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
		GROUT/BACKFILL METHOD: TREMIE
182.8		RISER PIPE LENGTH
	165.0	GROUT
		BENTONITE SEAL MATERIAL: PELLETS
	170.0	BENTONITE SEAL
414.1	180.0	TOP OF SCREEN
5.00		SCREEN LENGTH
		FILTER PACK MATERIAL: MEDIUM, WASHED SAND
409.1	185.0	BOTTOM OF SCREEN
	185.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NATURAL COLLAPSE
384.1	210.0	HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 210 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 4 HOURS

WATER REMOVED: 120 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: CLOUDY

COLOR BEFORE: GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	189.93	T/PVC	5/25/2016	9:15
DTB AFTER DEVELOPING:	190.40	T/PVC	5/25/2016	15:45
SWL BEFORE DEVELOPING:	21.91	T/PVC	5/25/2016	9:15
SWL AFTER DEVELOPING:	139.80	T/PVC	5/25/2016	15:45
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

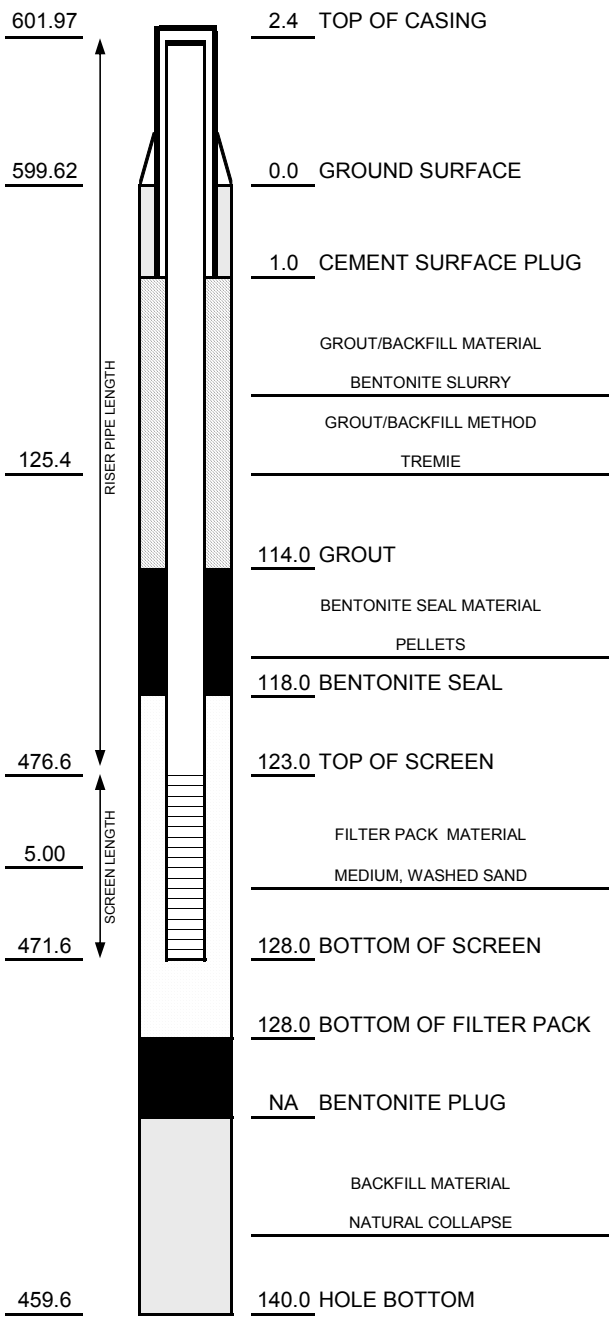
PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Range Road Landfill		WELL ID:	**MW-16-05**
PROJ. NO: 231828.0000	DATE INSTALLED: 5/13/2016 INSTALLED BY: C.DEVONO		CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)



2.4	TOP OF CASING
0.0	GROUND SURFACE
1.0	CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
	GROUT/BACKFILL METHOD: TREMIE
114.0	GROUT
	BENTONITE SEAL MATERIAL: PELLETS
118.0	BENTONITE SEAL
123.0	TOP OF SCREEN
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
128.0	BOTTOM OF SCREEN
128.0	BOTTOM OF FILTER PACK
NA	BENTONITE PLUG
	BACKFILL MATERIAL: NATURAL COLLAPSE
140.0	HOLE BOTTOM

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 2.5 HOURS

WATER REMOVED: 2,460 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: TURBID

COLOR BEFORE: GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	131.26	T/PVC	6/9/2016	14:03
SWL BEFORE DEVELOPING:	27.54	T/PVC	5/18/2016	9:05
SWL AFTER DEVELOPING:	28.26	T/PVC	5/18/2016	11:40
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Range Road Landfill			WELL ID: **MW-16-06**
PROJ. NO: 231828.0000	DATE INSTALLED: 5/10/2016	INSTALLED BY: C. DEVONO	CHECKED BY: C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)	
600.68	2.7	TOP OF CASING
598.00	0.0	GROUND SURFACE
	1.0	CEMENT SURFACE PLUG
		GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
		GROUT/BACKFILL METHOD: TREMIE
92.7		RISER PIPE LENGTH
	79.0	GROUT
		BENTONITE SEAL MATERIAL: MEDIUM CHIPS
	86.0	BENTONITE SEAL
508.0	90.0	TOP OF SCREEN
5.00		SCREEN LENGTH
		FILTER PACK MATERIAL: MEDIUM, WASHED SAND
503.0	95.0	BOTTOM OF SCREEN
	95.0	BOTTOM OF FILTER PACK
	NA	BENTONITE PLUG
		BACKFILL MATERIAL: NATURAL COLLAPSE
458.0	140.0	HOLE BOTTOM

NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
____ IN. FROM ____ TO ____ FT.

SURF. CASING DIAMETER: ____ IN. FROM ____ TO ____ FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 7.5 HOURS

WATER REMOVED: 3,522 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: TURBID

COLOR BEFORE: GRAY TO BROWN

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	99.60	T/PVC	5/11/2016	8:20
DTB AFTER DEVELOPING:	98.23	T/PVC	6/9/2016	14:22
SWL BEFORE DEVELOPING:	23.71	T/PVC	5/18/2016	11:55
SWL AFTER DEVELOPING:	23.74	T/PVC	5/18/2016	19:21
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

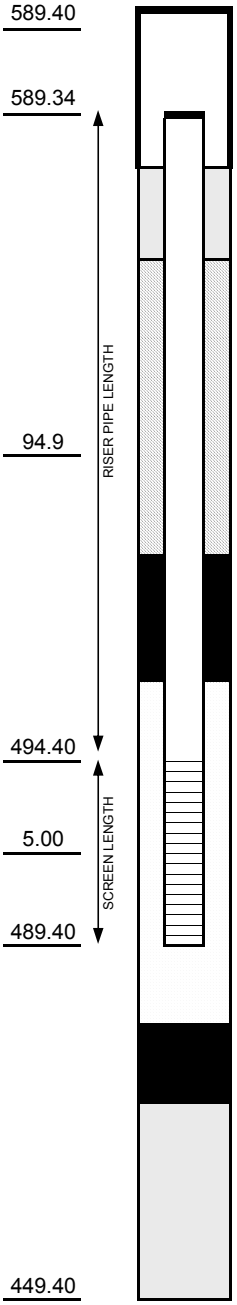
PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: DTE Electric Company Range Road Landfill		WELL ID:	**MW-16-07**
PROJ. NO: 231828.0000	DATE INSTALLED: 5/12/2016 INSTALLED BY: C. DEVONO	CHECKED BY:	C. Scieszka

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
589.40	0.0 GROUND SURFACE
589.34	0.1 TOP OF CASING
	1.0 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: BENTONITE SLURRY
	GROUT/BACKFILL METHOD: TREMIE
94.9	RISER PIPE LENGTH
	87.0 GROUT
	BENTONITE SEAL MATERIAL: PELLETS
	91.5 BENTONITE SEAL
494.40	95.0 TOP OF SCREEN
5.00	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
489.40	100.0 BOTTOM OF SCREEN
	100.0 BOTTOM OF FILTER PACK
	NA BENTONITE PLUG
	BACKFILL MATERIAL: NATURAL COLLAPSE
449.40	140.0 HOLE BOTTOM



NOTES:

CASING AND SCREEN DETAILS

TYPE OF RISER: 2-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SCREEN TYPE: 2-INCH PVC

SCR. SLOT SIZE: 0.01-INCH

BOREHOLE DIAMETER: 6 IN. FROM 0 TO 140 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: _____ IN. FROM _____ TO _____ FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: AIR LIFT

TIME DEVELOPING: 5.5 HOURS

WATER REMOVED: 200 GALLONS

WATER ADDED: 0 GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: TURBID

COLOR BEFORE: GRAY

CLARITY AFTER: CLEAR

COLOR AFTER: NONE

ODOR (IF PRESENT): NONE

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	99.65	T/PVC	5/13/2016	12:15
DTB AFTER DEVELOPING:	99.87	T/PVC	6/9/2016	14:45
SWL BEFORE DEVELOPING:	9.18	T/PVC	5/17/2016	9:30
SWL AFTER DEVELOPING:	18.05	T/PVC	5/18/2016	8:55
OTHER SWL:		T/PVC		
OTHER SWL:		T/PVC		

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☑ YES ☐ NO

LOCK KEY NUMBER: 3120