

**Revitalizing Auto Communities  
Environmental Response (RACER) Trust**

**Corrective Measure Pre-Design  
Summary Report – Lower 1,4-  
Dioxane Extraction and Injection  
Testing**

Plants 2 & 3 Industrial Land  
Lansing, Michigan

January 29, 2015



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Injection Testing**

Plants 2 & 3 Industrial Land  
Lansing, Michigan

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## **1. Introduction**

This Lower 1,4-Dioxane Extraction and Injection Testing Summary Report has been prepared on behalf of the Revitalizing Auto Communities Environmental Response (RACER) Trust for Plants 2 & 3 located in Lansing, Michigan (Site, Figure 1). This report presents an overview of the field activities and subsequent data processing and evaluation conducted in accordance with the Corrective Measures Pre-Design Work Plan - Lower 1,4-Dioxane Extraction and Injection Testing (Work Plan) dated August 6, 2014 (ARCADIS 2014a).

### **1.1 Lower 1,4-Dioxane Plume Overview**

The lower 1,4-dioxane plume is present in the deep overburden and weathered bedrock at depths generally ranging from 70 to 90 feet below grade. The lower 1,4-dioxane plume, extending from the Plant 3 “coliseum” area to the south-central portion of Plant 2, has been delineated with numerous vertical aquifer profiling borings and monitoring wells. The extent of the lower 1,4-dioxane plume and the general Site layout are presented on Figure 1.

At the 1,4-dioxane source area the plume is present in the saturated, deep overburden and weathered bedrock zones. South of the source area, the lower 1,4-dioxane plume coalesces and migrates primarily within the weathered bedrock zone. The transition from weathered bedrock to consolidated rock is gradational and, for the purposes of this evaluation, the weathered bedrock zone is estimated to be approximately 15 feet thick. The bedrock consists of the Grand River Formation to the north and Saginaw Formation to the south. The contact between these units is in the vicinity of the Plant 2 North test wells (Figure 1). The Grand River Formation is fine- to medium-grained sandstone that occupies erosional valleys within the Saginaw Formation (United States Geological Survey and National Park Service 2000). The Saginaw Formation consists of finer-grained sandstone with thin layers of shale of varying thickness.

Groundwater elevation measurements collected from the monitoring wells installed along the lower 1,4-dioxane plume reflect a complex heterogeneous aquifer structure. Due to large vertical gradients observed at certain areas of the Site, the observed groundwater elevation varies depending on the specific depth of a well. Based on the evaluation presented in the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Phase 2 Supplemental Report (ARCADIS 2014b), as well as analyses completed in March and April 2014 using passive flux meters (PFMs; EnviroFlux, Inc.), the groundwater flow along the lower 1,4-dioxane plume appears to

be southerly, consistent with the plume morphology. The Passive Flux Meter and Transducer Study Memorandum (ARCADIS 2014c, as revised) presents a summary of the PFM study and results.

## **1.2 Groundwater Recirculation Overview**

A draft RCRA Corrective Action Corrective Measures Study (RCRA CMS Report) was prepared and submitted for the Site in June 2014 (ARCADIS 2014d). The CMS evaluated corrective measure alternatives based on the findings of the RFI and proposed the corrective measure(s) to be taken. One of the proposed corrective measures is a groundwater recirculation system for the lower 1,4-dioxane plume. The groundwater recirculation system would consist of extraction of groundwater from the plume via extraction wells, above-grade treatment of groundwater, and reinjection of treated groundwater back into the plume via injection wells. Recirculation of the groundwater enhances pore flushes and mass removal, making the remedy more aggressive and resulting in a shorter timeframe when compared to other pumping-only alternatives.

Groundwater recirculation was the remedy proposed to address the lower 1,4-dioxane plume because it is cost-effective and will remediate the plume in a relatively short timeframe. The remedial objective of the groundwater recirculation system is to reduce groundwater concentrations of 1,4-dioxane in the aquifer on site to a concentration that will not migrate off site at concentrations higher than the current Part 201 Criteria, unless restrictions are instituted off site.

Preliminary treatability testing results indicated that the advanced oxidation process can effectively reduce concentrations of 1,4-dioxane in extracted groundwater to less than 1 microgram per liter ( $\mu\text{g/L}$ ). In order to design the most effective full-scale remedy, a pre-design study was completed to evaluate the lower 1,4-dioxane plume source area located south of the coliseum (ARCADIS 2014e). Results of the evaluation suggest a lower 1,4-dioxane source mass that has been depleted, with the remaining, generally low concentration mass located within low permeability sediments. The majority of the 1,4-dioxane present in the lower 1,4-dioxane plume is currently located downgradient of the source area. Based on nature and distribution of 1,4-dioxane in the dry perched zone soils and limited potential for leaching, it is recommended that no remediation of the dry perched zone soils be performed at this time. The following discussion focuses on the characterization and implementability of recirculation within the weathered bedrock, both beneath the source area and within downgradient portions of the lower 1,4-dioxane plume.

### **1.3 Test Objectives**

The objectives of the extraction and injection testing were to estimate design parameters, such as hydraulic conductivity, transmissivity, and pumping/injection requirements, to evaluate a potential directed groundwater recirculation (DGR) system to treat the lower 1,4-dioxane plume present at the Site. Specifically, the tests evaluated the following:

- Groundwater extraction parameters from the lower 1,4-dioxane plume, including:
  - Extraction flow rate variability along the plume in the weathered bedrock (primary transport pathway)
  - Drawdown along the plume and the feasibility of keeping extraction well screens submerged
  - The optimal extraction well transect spacing
- Groundwater injection parameters; specifically, the injection flow rate variability within the weathered bedrock
- Water quality of the extracted groundwater during pumping, specifically 1,4-dioxane and iron, to support the design of the above-grade treatment system

Due to the elevated concentrations of iron within the aquifer, prolonged dewatering of an extraction well screen will lead to fouling. Understanding the amount of water that could be extracted from the weathered bedrock unit given the limited saturated thickness is key to evaluating the potential recirculation system.

## **2. Hydraulic Testing Activities and Results Summary**

A series of hydraulic tests, including extraction, injection, and/or recirculation testing, was completed at three locations along the lower 1,4-dioxane plume in September and October 2014. Locations of the tests are as follows (Figure 2):

- Source area (Plant 3) - downgradient of the deep overburden source area along the axis of the mapped lower 1,4-dioxane plume (step, extraction, injection, and recirculation tests)
- Mid-plume (Plant 2 North) - located on Plant 2 near existing transect of monitoring wells MW-13-42 through MW-13-45 (step, extraction, injection, and recirculation tests)
- Toe of the plume (Plant 2 South) - 50 feet downgradient of the last vertical aquifer profile boring that indicated 1,4-dioxane impacts to the weathered bedrock (VAP-P2-OS100) (step, extraction, and recirculation tests)

### **2.1 Well Network and Groundwater Elevation Monitoring**

The extraction and injection testing well network is presented on Figure 2. Three extraction wells (PW-14-01, PW-14-02, and PW-14-03), three injection wells (TW-14-03, TW-14-01, and TW-14-07), and six monitoring wells (TW-14-02, TW-14-04, TW-14-05, TW-14-06, TW-14-08, and TW-14-09) were installed in August and September 2014.

New Site wells were installed in accordance with the Work Plan, and nine existing monitoring wells were incorporated into the hydraulic testing well network (MW-13-22, MW-13-25, MW-13-28, MW-13-29, MW-13-42, MW-13-43, MW-13-44, MW-13-45, and MW-12-01). A summary of well construction information for test and monitoring wells is presented in Table 1; soil boring and well construction logs for new wells are included in Appendix A. All of the wells included as part of the hydraulic testing activities are identified on Figure 2.

Water levels at test and observation wells were monitored by data-logging pressure transducers prior to and during hydraulic testing activities. Initial processing of water levels included conversion of gage pressures to groundwater elevations through comparison to manual water-level data collected periodically during transducer deployment. Previous Site investigations (ARCADIS 2014c) indicated that Site wells

screened within the weathered and competent bedrock have high barometric efficiencies (BEs); as a result, it is necessary to remove effects of atmospheric (barometric) pressure fluctuations from Site water levels prior to analyzing the test data. Atmospheric pressures measured hourly at a nearby airport (KLAN) were used for correction of Site water levels. Water-level data for each well were first examined to identify the effects of barometric influence on the water levels, and then corrections (BE) were mathematically applied to remove effects. BEs of 0.95 to 1.0 was applied to well water levels for 18 of the 21 wells monitored. No correction was applied to PW-14-03 levels due to the little to no BE at this well compared to the drawdown response, and water-levels at MW-12-01 and MW-13-25 were not corrected due to uncertainty of the level of BE at these well locations. Plots of groundwater elevations before and after correction are presented in Appendix B.

## **2.2 Hydraulic Testing Activities**

The extraction, injection, and recirculation testing were conducted at Plant 2 North between September 29 and October 8, 2014; at Plant 2 South between October 8 and October 10, 2014; and at Plant 3 between October 14 and October 21, 2014. The approximate dates, durations, and rates (in gallons per minute [gpm]) for each test at each of the three areas are presented in Table 2 below.



**Table 2.** Summary of Hydraulic Testing Activities

Area	Test Type	Start Date	Start Time	Approximate Duration (hours)	Extraction/Injection Rate Range (gpm)	Representative Rate (gpm)
P2N	Extraction (EXT) Test	9/29/14	15:13	65	0.4 - 1.7	0.5
P2N	Injection (INJ) Test	10/2/14	13:18	42	6.1 - 8.5	6.5
P2N	Recirculation Test	EXT/INJ: 10/6/14	10:44	EXT/INJ: 45	EXT: 0.4 - 1.5 INJ: 0.4 - 6.5	EXT: 1.5 INJ: 6.5
P2S	Extraction Test	10/8/14	13:58	35	0.1 - 0.5	0.1
P2S	Recirculation Test	EXT: 10/10/14 INJ: 10/10/14	11:40 12:21	10	EXT: 0.1 INJ: 0.8	EXT: 0.1 INJ: 0.8
P3	Extraction Test	10/14/14	12:15	45	0.3 - 1.0	0.3
P3	Injection Test	10/16/14	13:38	30	4.8 - 5.0	5.0
P3	Recirculation Test	EXT/INJ: 10/20/14	11:10	22	EXT: 0.3 - 0.4 INJ: 4.5 - 5.0	EXT: 0.4 INJ: 4.8

Note:  
gpm - gallons per minute  
P3 – Plant 3 Test Area  
P2N – Plant 2 North Test Area  
P2S – Plant 2 South Test Area

Step-drawdown pumping tests were performed at each extraction well prior to constant-rate extraction testing in order to estimate optimum extraction rates for longer testing. The optimum extraction rate was selected as the maximum rate which could be sustained for a longer-term pumping test that would not dewater the extraction well screen.

Several of the extraction and injection tests performed at the Site were selected for analysis to estimate aquifer properties (transmissivity/hydraulic conductivity and storativity). Time-drawdown data collected at observation wells were analyzed using appropriate and applicable analytical solutions in AQTESOLV for Windows® (Duffield 2007). All AQTESOLV analyses were completed assuming fully penetrating wells and an estimated combined aquifer thickness of 15 feet for the weathered bedrock/deep overburden hydrostratigraphic units. Drawdown data collected at the test wells (injection or extraction) were not explicitly analyzed using AQTESOLV due to well losses reflective of degree of well efficiency. Injection tests were analyzed as extraction tests in AQTESOLV, with the assumption that parameter estimates were analogous due to the confined conditions.

A detailed summary of the hydraulic test activities completed in each test area is provided as Appendix C. The summary of the hydraulic testing results for Plant 3, Plant 2 North, and Plant 2 South are provided on Tables 3, 4, and 5, respectively.

### **2.3 Analytical Sample Collection**

During the long-term extraction testing in each area, laboratory samples were collected periodically for iron and 1,4-dioxane. In general, the sampling frequency included a baseline sample collected before testing began, as well as a sample collected at the beginning, middle, and end of the long-term constant rate tests. A total of 14 samples were collected: four from Plant 3, six from the Plant 2 North, and four from the Plant 2 South area. A source water sample (potable water used for the injection and recirculation tests) was also collected to verify that constituents of concern (COCs) were not introduced into the aquifer during testing. A table summarizing the analytical data is provided as Table 7. Laboratory analytical reports are included as Appendix F.

In general, although baseline concentrations of 1,4-dioxane at Plant 3 and Plant 2 South were lower initially, samples collected during testing indicate that the concentration of 1,4-dioxane remained relatively consistent at all three locations. Average concentrations during testing at Plant 3, Plant 2 North, and Plant 2 South were 377, 388, and 553 µg/L, respectively.

### **3. Evaluation of Test Data**

Results of hydraulic testing within the weathered bedrock hydrostratigraphic unit at three areas of the Site were interpreted within the context of existing Site data and the conceptual site model (CSM) to estimate design parameters for a potential recirculation retreatment system to treat the lower 1,4-dioxane plume present at the Site.

#### **3.1 Hydraulic Parameters**

Hydraulic parameters estimated from analysis of extraction and injection test data are relatively consistent within different areas of the Site, and those previously reported as part of the CSM, with some spatial variability.

- Plant 3 - The geometric mean of hydraulic conductivities estimated from the Plant 3 injection test data is 11.3 ft/day, approximately one order of magnitude higher than the estimates at Plant 2 South.
- Plant 2 North - Three analyses were conducted from data collected at Plant 2 North; hydraulic conductivities for each of the tests are similar, ranging from 1.4 to 3.1 ft/day, and show good agreement between hydraulic conductivities estimated from extraction testing and injection testing.
- Plant 2 South - Hydraulic conductivities estimated from the Plant 2 South extraction tests show variability between observation wells TW-14-02 and TW-14-01, but geometric mean values for the full duration and late-time pumping test analyses are similar (0.8 and 1.0 ft/day).

Based on the results of the testing, the hydraulic conductivity appears to be higher within the weathered Grand River Formation at Plant 3, consistent with the CSM. This difference may also be due to spatial variability of aquifer thickness because all parameterization analyses were performed using an estimated thickness of 15 feet.

Storativity estimates show more variability; two orders of magnitude from the lowest estimates ( $2.7 \times 10^{-5}$ , from the late-time pumping test analysis at Plant 2 North) to the highest ( $1.8 \times 10^{-3}$  from analysis of late-time pumping at Plant 2 South). Based on the geology at the Site, which indicates a silty-clay confining unit present above bedrock, the results are generally consistent with more confined aquifer conditions at Plant 3 and less confined on Plant 2 South, where the static water level is below the bottom of the confining unit.

### **3.2 Constituent of Concern Variability**

Groundwater samples collected during long-term extraction testing indicate that, although baseline concentrations of 1,4-dioxane at Plant 3 and Plant 2 South were lower initially, the concentration of 1,4-dioxane remained relatively consistent at all three locations. Average 1,4-dioxane concentrations during testing at Plant 3, Plant 2 North, and Plant 2 South were 377, 388, and 553 µg/L, respectively. Iron concentrations were also elevated at all three locations.

### **3.3 Anisotropy and vertical flow**

Hydraulic testing results were also interpreted with respect to horizontal anisotropy and vertical communication between aquifer units to assess potential preferential or non-preferential pathways for flow and contaminant transport. As shown on Figure 2, new injection, extraction, and observation wells at Plant 3 and Plant 2 North were installed along linear transects, with wells TW-14-06 (Plant 3) and TW-14-04 (Plant 2 North) located offset from the transects.

- Plant 3 – At Plant 3, wells TW-14-06 and TW-14-09 are located at reasonably similar distances (42 and 37 feet) from injection well TW-14-07. These wells showed displacement similar to that of a response to injection (2.01 and 2.09 feet, respectively) as well as estimated hydraulic conductivity (9.8 and 10.0 ft/day), which does not indicate that horizontal anisotropy is significant at this location for this test scale. Displacement (0.36 feet) was observed at MW-12-22, 135 ft up-gradient of the injection well, indicating connectivity along the lower 1,4-dioxane plume axis.
- Plant 2 North - Comparison of displacement at Plant 2 North well TW-14-04 (located off the transect) to displacement at wells MW-13-43 and TW-14-03 (extraction testing) and TW-14-05 and PW-14-02 (injection testing) indicates a small degree of anisotropy, in that displacements at TW-14-04 in response to extraction and injection are slightly less than expected when compared to displacement to wells TW-14-03 and PW-14-02, as summarized in Table 4. However, these differences are relatively small, and may be due to heterogeneity rather than anisotropy at this scale.

In each test area, a bedrock well was also monitored to assess potential hydraulic connection between the weathered bedrock and deeper consolidated bedrock units.

- Plant 3 - At the Plant 3 water levels at bedrock well MW-13-28 were displaced 0.56 feet in response to injection at TW-14-07 located 83 feet away. The magnitude of displacement and estimated parameters (hydraulic conductivity and storativity) at this well are consistent with displacement and estimated parameters at weathered bedrock wells for this test, which suggest significant vertical communication between the weathered bedrock and bedrock at this location, consistent with previous findings (ARCADIS 2014c).
- Plant 2 North - The Plant 2 North bedrock well (MW-13-44) did not show a response to pumping or injection, while observation wells located farther from the extraction and injection wells did show response, indicating a strong resistance to vertical flow at this location.
- Plant 2 South – A response was not observed at the closest bedrock well to this location - MW-12-01, located more than 300 feet from the test area.

### **3.4 Extraction and Injection Rates and Capabilities**

Hydraulic testing data indicated significant differences between potential rates of injection and extraction. Table 6 summarizes the flow rates and specific capacities calculated for the extraction, injection, and recirculation tests performed at each area. Extraction rates were lower than expected, and varied from 0.1 gpm at Plant 2 South to 0.5 gpm at Plant 2 North; whereas rates of injection were significantly higher. Specific capacities were relatively similar between injection and extraction rates at each area, indicating that well efficiencies were not likely the issue. The disparity between rates is due to the relatively small vertical thickness of the weathered bedrock unit, correspondingly short well screens, and the relatively short water column in each of the wells. Static depths to water in weathered bedrock wells are approximately 65 to 75 feet below ground surface, and well screens are typically submerged less than 10 feet below the water level. This limits the potential drawdown in the pumping well, but allows a large positive displacement of more than 60 feet during injection.

Increases in extraction rates during recirculation testing were observed in comparison to sustainable rates for extraction alone. Specific capacities at the extraction wells increased 13 percent at Plant 3, 220 percent at Plant 2 North, and 72 percent at Plant 2 South during the recirculation test. However, these numbers are specific to the testing performed and may improve or change for different injection/extraction well spacing, duration of recirculation, and/or geometry configurations selected for optimal recirculation cell design.

#### **4. Conclusions and Recommendations**

Hydraulic testing was completed at three locations along the axis of the lower 1,4-dioxane plume. Based on the data presented above, ARCADIS offers the following conclusions:

- Hydraulic conductivity of the weathered, relatively homogeneous Grand River Formation (Plant 3) is higher than that of the interbedded sandstone and shale Saginaw Formation (Plant 2):
  - Grand River Formation: 9 - 16 ft/day
  - Saginaw Formation: 0.8 - 4 ft/day
- Based on response observed within bedrock wells in the vicinity of the Plant 3 and Plant 2 North tests, the vertical anisotropy of the Saginaw Formation is much higher than that of the Grand River Formation.
- Extraction rates within all three areas of the Site are limited by the saturated thickness of the weathered bedrock zone and limited available drawdown.
  - Easier to inject than extract due to the large positive displacement (65 to 75 feet) available for injection
  - Extraction rates and overall specific capacity of the weathered bedrock aquifer can be improved by recirculation of groundwater.

The overall results are generally consistent with the CSM, except that extraction well yields are lower than expected. This could be due to the limited available drawdown associated with the saturated thickness of the confined weathered bedrock zone, and/or potential formation damage due to sonic drilling methods. Remediation well drilling methods will be evaluated as part of the proposed tracer testing, as discussed below. If the lower yield cannot be improved through drilling methods, the result is that more extraction wells will be required to achieve the flow and spatial coverage to meet the objectives of the DGR remedy proposed in the CMS.

Injection and recirculation testing results indicate that well capacity is higher during injection mainly because of the applied injection head, which is not subject to limitations imposed by the available drawdown. There is also an improvement in yield

associated with the combined operation of extraction and injection wells during recirculation for the same reason. While a DGR strategy can be developed using a prescribed array of few injection wells and many extraction wells, ARCADIS recommends that the likely increase in capital and operational costs warrants further evaluation of technologies that complement the DGR remedy. The hydraulic efficiency of DGR can be improved through the addition of reagents that create biological or chemical reactive zones and limit potential spreading associated with hydraulics operations with fewer extraction wells.

ARCADIS recommends additional pre-design studies to evaluate the applicability and implementability associated with in-situ chemical oxidation (ISCO) and enhanced bioremediation as part of the proposed CMS DGR remedy for the weather bedrock zone. Additional data are required to evaluate the DGR-complementary, injection-based remedies including the volume-to-radius relationship (i.e., mobile porosity), groundwater velocity, and the various parameters for evaluating the efficacy of ISCO. As a follow-up to the hydraulic testing, a tracer test is proposed at the Plant 3 and Plant 2 North study areas. The proposed tracer study would include the following:

- Injection of a tracer/oxidant and dose response monitoring in a nearby monitoring well to determine mobile porosity.
- Downgradient tracer/oxidant drift monitoring to determine oxidant persistence, groundwater velocity, and groundwater flow direction.

A detailed work plan outlining the proposed tracer study will be provided to the Michigan Department of Environmental Quality (MDEQ) during the first quarter 2015.

ARCADIS is also evaluating the potential for bioremediation of 1,4-dioxane at the Site and will provide a summary of the biologic characterization as part of the annual groundwater monitoring report during the second quarter of 2015.

## **5. References**

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**Tables**

**Table 1**  
**Hydraulic Testing Well Information**  
**RACER Trust Plants 2 and 3**  
**Lansing, Michigan**

Area	WELL ID	Well Type	Screen top (feet bgs)	Screen bottom (feet bgs)	Static Depth- to-water (feet bTOC)	Well Casing Diameter (inches)	Distance to PW (feet)	Distance to IW (feet)
PLANT 2 NORTH	PW-14-02	PW	75	80	71.03	6	0	53
	TW-14-03	IW	75	80	70.51	2	53	0
	MW-13-42	OW	70	75	75.28	2	276	269
	MW-13-43	OW	72	77	70.40	2	31	21
	MW-13-44	OW	96	115	82.12	4	31	24
	MW-13-45	OW	72	77	69.60	2	220	235
	TW-14-04	OW	72	77	70.56	2	43	41
	TW-14-05	OW	72	77	70.36	2	16	36
PLANT 2 SOUTH	PW-14-01	PW	72	77	67.47	6	0	47
	TW-14-01	IW	70	75	67.66	2	47	0
	MW-12-01	OW	87	110	81.23	4	399	352
	TW-14-02	OW	67	72	65.55	2	15	50
PLANT 3	PW-14-03	PW	78	85	76.04	6	0	61
	TW-14-07	IW	83	88	74.70	2	61	0
	MW-13-22	OW	89	94	72.45	2	196	135
	MW-13-25	OW	67	72	69.20	2	153	147
	MW-13-28	OW	99	116	73.19	4	140	83
	MW-13-29	OW	68	73	68.82	2	104	165
	TW-14-06	OW	82	87	74.19	2	42	42
	TW-14-08	OW	84	89	74.21	2	45	16
	TW-14-09	OW	84	89	74.73	2	25	37

**Notes:**

bgs = below ground surface

bTOC = below top of casing

PW = extraction well

IW = injection well

OW = observation well

**Table 3**  
**Plant 3 Hydraulic Testing Results**  
**RACER Trust Plants 2 and 3**  
**Lansing, Michigan**

Well ID	Screened Interval (feet bgs)	Distance from Pumping/ Injection Well (feet)	Maximum Displacement (feet)	Solution Method	Estimated Transmissivity (T, ft <sup>2</sup> /day)	Estimated Storativity (S, dimensionless)	Calculated Hydraulic Conductivity (K, ft/day)
<b>Injection Test - TW-14-07 - 10/16/2014- 10/17/2014 (5 gpm, 30 hours)</b>							
TW-14-07	83 - 88	0	72.42	NA	NA	NA	NA
TW-14-08	84 - 89	16	8.5	Cooper-Jacob	130	7.1E-07	8.7
TW-14-09	84 - 89	37	2.01	Cooper-Jacob	147	5.1E-03	9.8
TW-14-06	82 - 87	42	2.09	Cooper-Jacob	150	3.9E-03	10.0
PW-14-03	78 - 85	61	0.68	Theis	154	3.6E-02	10.3
MW-13-28	99 - 116	83	0.56	Theis	214	2.2E-02	14.3
MW-13-22	89 - 94	135	0.36	Theis	246	1.5E-02	16.4
<b>Geometric Mean:</b>					<b>169</b>	<b>2.3E-03</b>	<b>11.3</b>

**Notes:**

1. bgs = below ground surface
2. gpm = gallons per minute
3. NA = not analyzed
4. Aquifer thickness was estimated as 15 feet

**References:**

Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.  
Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

**Table 4**  
**Plant 2 North Hydraulic Testing Results**  
**RACER Trust Plants 2 and 3**  
**Lansing, Michigan**

Well ID	Screened Interval (feet bgs)	Distance from Pumping/ Injection Well (feet)	Maximum Displacement (feet)	Solution Method	Estimated Transmissivity (T, ft <sup>2</sup> /day)	Estimated Storativity (S, dimensionless)	Calculated Hydraulic Conductivity (K, ft/day)
<b>Pumping Test (Early Time) - PW-14-02 - 9/29/2014 (variable rate, 15 hours)</b>							
PW-14-02	75 - 80	0	10.80	NA	NA	NA	NA
TW-14-05	72 - 77	16	3.12	Theis	11.5	2.7E-03	0.8
MW-13-43	72 - 77	31	2.95	Theis	15.9	5.1E-04	1.1
MW-13-44	96-115	31	NA	NA	NA	NA	NA
TW-14-04	72 - 77	43	1.11	Theis	32.5	9.7E-04	2.2
TW-14-03	75 - 80	53	1.35	Theis	37.4	4.1E-04	2.5
<b>Geometric Mean:</b>					<b>22</b>	<b>8.6E-04</b>	<b>1.4</b>
<b>Pumping Test (Late Time) - PW-14-02 - 9/30/2014-10/2/2014 (0.5 gpm, 40 hours)</b>							
PW-14-02	75 - 80	0	5.61	NA	NA	NA	NA
TW-14-05	72 - 77	16	3.44	Cooper-Jacob	62.1	unrealistic	4.1
MW-13-43	72 - 77	31	2.77	Cooper-Jacob	24.8	5.0E-04	1.7
MW-13-44	96-115	31	NA	NA	NA	NA	NA
TW-14-04	72 - 77	43	1.23	Cooper-Jacob	62.1	6.5E-06	4.1
TW-14-03	75 - 80	53	1.50	Cooper-Jacob	48.6	5.9E-06	3.2
<b>Geometric Mean:</b>					<b>46</b>	<b>2.7E-05</b>	<b>3.1</b>
<b>Injection Test - TW-14-03 - 10/2/2014-10/4/2014 (6.1 gpm, 39 hours)</b>							
TW-14-03	75 - 80	0	66.85	NA	NA	NA	NA
MW-13-43	72 - 77	21	25.94	Cooper-Jacob	31.0	6.7E-05	2.1
TW-14-05	72 - 77	36	17.51	Cooper-Jacob	27.8	5.7E-04	1.9
MW-13-44	96-115	24	NA	NA	NA	NA	NA
TW-14-04	72 - 77	41	13.43	Cooper-Jacob	48.0	1.6E-04	3.2
PW-14-02	75 - 80	53	14.87	Cooper-Jacob	28.6	5.2E-04	1.9
<b>Geometric Mean:</b>					<b>33</b>	<b>2.4E-04</b>	<b>2.2</b>

**Notes:**

1. bgs = below ground surface
2. gpm = gallons per minute
3. NA = not analyzed
4. Aquifer thickness was estimated as 15 feet

**References:**

Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

**Table 5**  
**Plant 2 South Hydraulic Testing Results**  
**RACER Trust Plants 2 and 3**  
**Lansing, Michigan**

Well ID	Screened Interval (feet bgs)	Distance from Pumping/ Injection Well (feet)	Maximum Displacement (feet)	Solution Method	Estimated Transmissivity (T, ft <sup>2</sup> /day)	Estimated Storativity (S, dimensionless)	Calculated Hydraulic Conductivity (K, ft/day)
<b>Pumping Test (Full Duration) - PW-14-01 - 10/8/2014 - 10/10/2014 (variable rate, 35 hours)</b>							
PW-14-01	72 - 77	0	7.92	NA	NA	NA	NA
TW-14-02	67 - 72	15	0.39	Dougherty-Babu	15.3	4.1E-03	1.0
TW-14-01	70 - 75	47	0.28	Dougherty-Babu	8.9	2.6E-03	0.6
<b>Geometric Mean:</b>					<b>12</b>	<b>3.3E-03</b>	<b>0.8</b>
<b>Pumping Test (Late Time) - PW-14-01 - 10/8/2014 - 10/10/2014 (0.1 gpm, 28 hours)</b>							
PW-14-01	72 - 77	0	6.62	NA	NA	NA	NA
TW-14-02	67 - 72	15	0.39	Cooper-Jacob	20.0	1.7E-03	1.3
TW-14-01	70 - 75	47	0.28	Cooper-Jacob	10.5	1.9E-03	0.7
<b>Geometric Mean:</b>					<b>14</b>	<b>1.8E-03</b>	<b>1.0</b>

**Notes:**

1. bgs = below ground surface
2. gpm = gallons per minute
3. NA = not analyzed
4. Aquifer thickness was estimated as 15 feet

References:

Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.

Dougherty, D.E and D.K. Babu, 1984. Flow to a partially penetrating well in a double-porosity reservoir, Water Resources Research, vol. 20, no. 8, pp. 1116-1122.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

**Table 6**  
**Summary of Specific Capacity Results**  
**RACER Trust Plants 2 and 3**  
**Lansing, Michigan**

Pumping Well	Plant	Constant Rate Extraction Test			Constant Rate Injection Test			Recirculation Test			
		Pumping Rate	Drawdown	Specific Capacity	Injection Rate	Displacement	Specific Capacity	Pumping Rate	Injection Rate	Drawdown at Extraction Well	Specific Capacity at Extraction Well
		gpm	feet	gpm/ft	gpm	feet	gpm/ft	gpm	gpm	feet	gpm/ft
PW-14-03	P3	0.3	6.92	0.043	5	72.4	0.069	0.4	4.8	8.13	0.049
PW-14-02	P2N	0.5	5.61	0.089	6.5	66.9	0.097	1.5	6.5	5.25	0.29
PW-14-01	P2S	0.1	7.92	0.013	NA	NA	NA	0.1	0.8	4.6	0.022

**Notes:**

hrs - hours

gpm - gallons per minute

ft - feet

NA - Test not completed

**Table 7**  
**Summary of Groundwater Analytical Results**  
**RACER Trust Plant 2 and 3,**  
**Lansing, Michigan**

Sample ID	Date Sampled	Metals		1,4-Dioxane
		Iron	Iron Dissolved	
<b>Part 201 Residential Drinking Water Criteria</b>		<b>301 (E)</b>	<b>301 (E)</b>	<b>85</b>
<b>Plant 3 Test Area (P3)</b>				
PW-14-03_091814	9/18/2014	540	---	77
PW-14-03(101414) Begin	10/14/2014	19,500	---	400
PW-14-03(101514) Mid	10/15/2014	19,700	---	370
PW-14-03(101614) End	10/16/2014	19,100	---	360
<b>Plant 2 North Test Area (P2N)</b>				
PW-14-02_091814	9/18/2014	3,280	2,330	440
PW-14-02(093014)Begin	9/30/2014	54,900	---	460
PW-14-02(093014)Begin-2	9/30/2014	10,100	---	390
PW-14-02(093014)Begin-3	9/30/2014	3,030	---	380
PW-14-02(100114)Mid	10/1/2014	2,330	---	380
PW-14-02(100214)36H	10/2/2014	2,300	---	330
<b>Plant 2 South Test Area (P2S)</b>				
PW-14-01_091914	9/19/2014	100	---	260
PW-14-01(100914)Mid	10/9/2014	5,240	---	560
PW-14-01(100914)End	10/9/2014	4,960	---	530
PW-14-01(101014)End-2	10/10/2014	5,120	---	570
<b>QA/QC</b>				
Injection Source Water(100214)	10/2/2014	1,780	---	<5.0

**Notes:**

All units are presented in micrograms per liter (µg/L [ppb]).

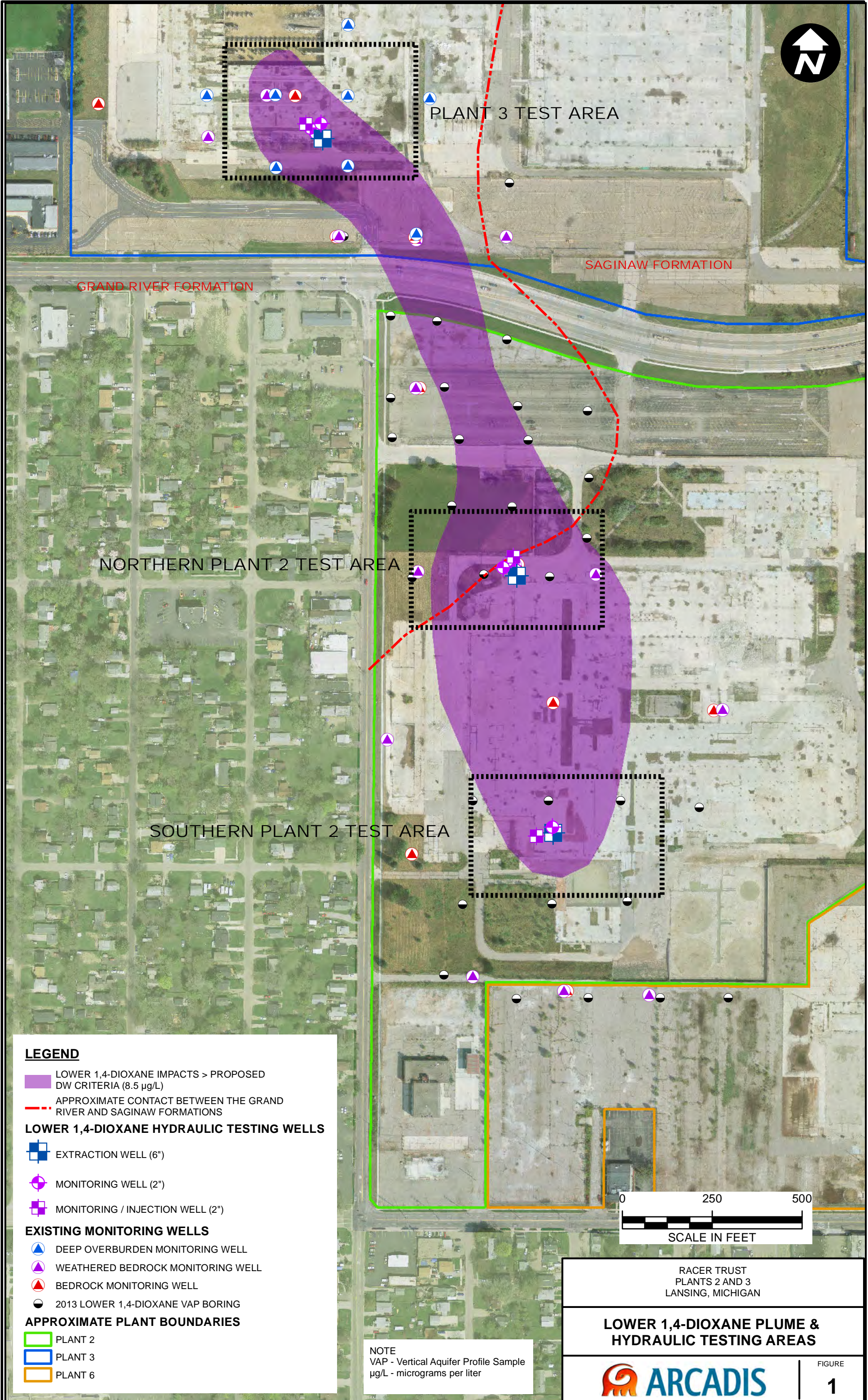
MDEQ Part 201 Generic Cleanup Criteria and Screening Levels, Dated December 30, 2013.

ft bgs - feet below ground surface

(E) - Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).

## Figures

CITY: BRIGHTON DIV: ENV DB: D. OLEXA PIC: CHRIS PETERS PM: AMY HOEKSEMA TM: RANDY CHRISTENSEN TR: JACKIE SALING PROJECT NUMBER: B0064479.2013 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl  
 G:\GIS\Project Files\Motor\liquidation\Company\Lansing\Docs\Hydraulic Testing Report\Figure 1 - Plume overview.mxd PLOTTED: 1/28/2015 11:24:55 AM BY: PCurry



**LEGEND**

- LOWER 1,4-DIOXANE IMPACTS > PROPOSED DW CRITERIA (8.5 µg/L)
- APPROXIMATE CONTACT BETWEEN THE GRAND RIVER AND SAGINAW FORMATIONS

**LOWER 1,4-DIOXANE HYDRAULIC TESTING WELLS**

- EXTRACTION WELL (6")
- MONITORING WELL (2")
- MONITORING / INJECTION WELL (2")

**EXISTING MONITORING WELLS**

- DEEP OVERBURDEN MONITORING WELL
- WEATHERED BEDROCK MONITORING WELL
- BEDROCK MONITORING WELL
- 2013 LOWER 1,4-DIOXANE VAP BORING

**APPROXIMATE PLANT BOUNDARIES**

- PLANT 2
- PLANT 3
- PLANT 6

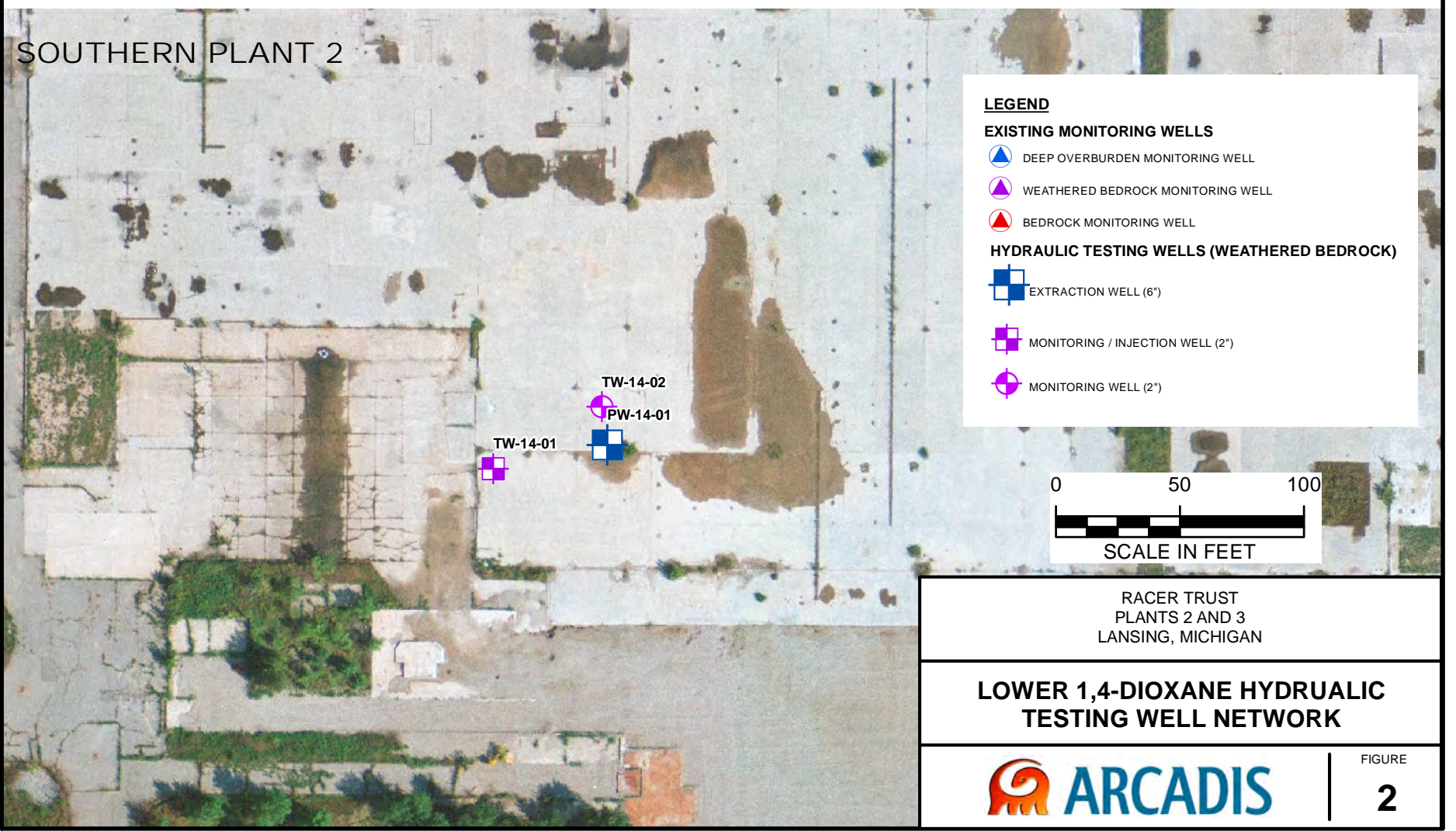
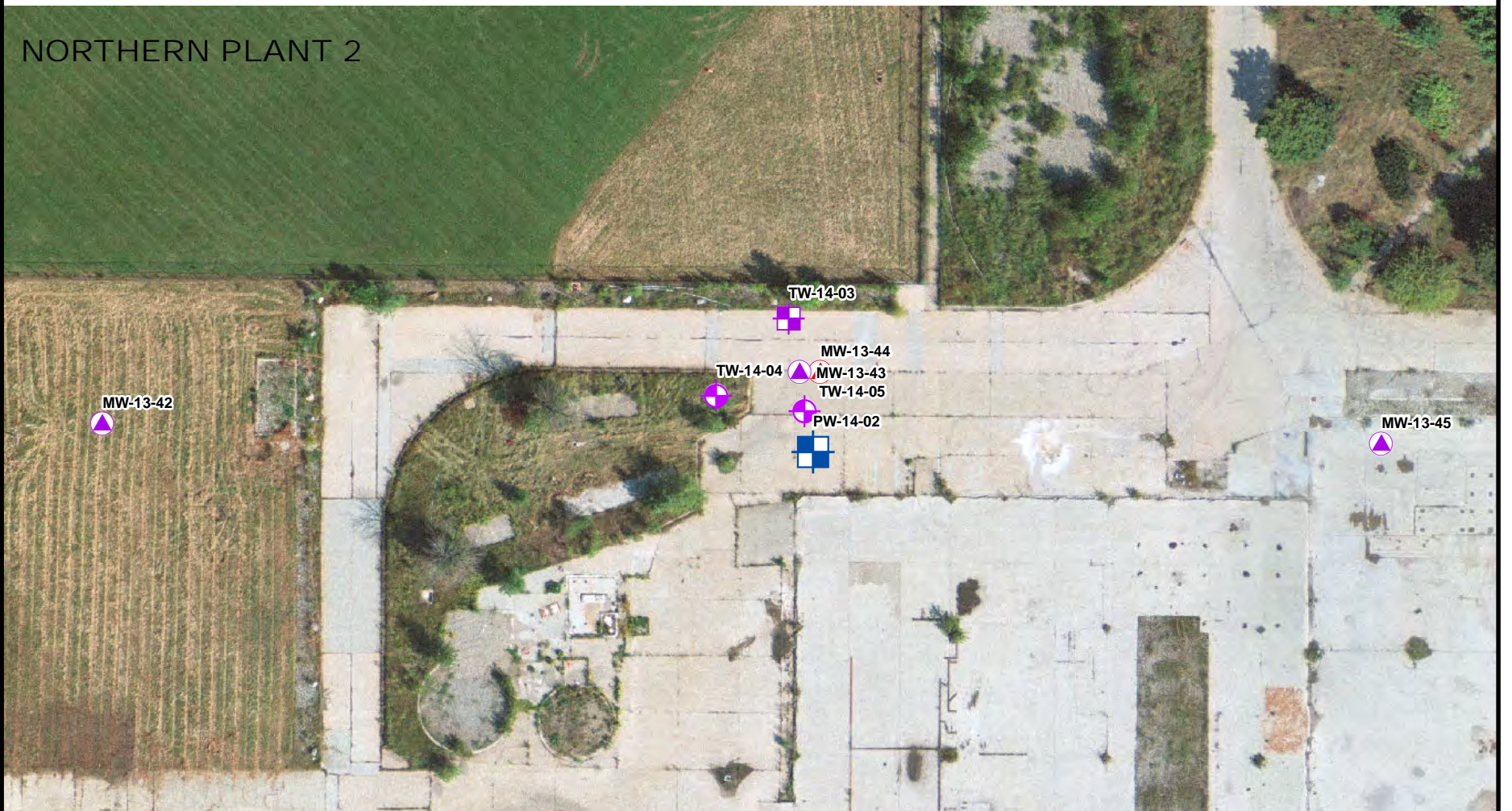
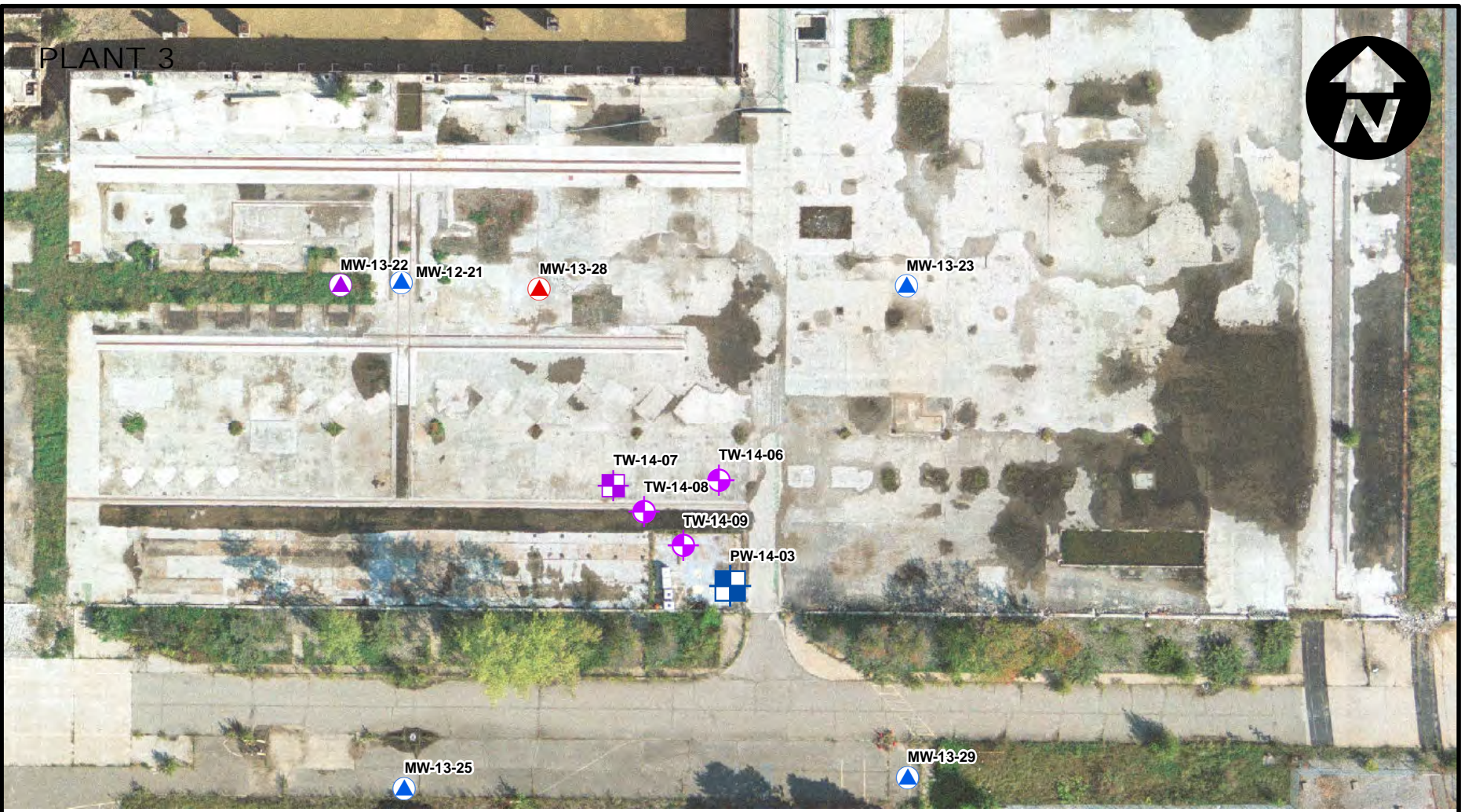
NOTE  
 VAP - Vertical Aquifer Profile Sample  
 µg/L - micrograms per liter

RACER TRUST  
 PLANTS 2 AND 3  
 LANSING, MICHIGAN

**LOWER 1,4-DIOXANE PLUME & HYDRAULIC TESTING AREAS**



CITY: BRIGHTON DIV: ENV DB: D. OLEXA PIC: CHRIS PETERS PM: AMY HOEKSEMA TM: RANDY CHRISTENSEN TR: JACKIE SALING PROJECT NUMBER: B0064479.2013 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl  
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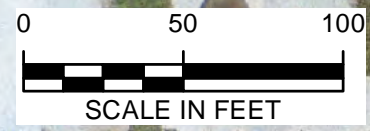
**LEGEND**

**EXISTING MONITORING WELLS**

- DEEP OVERBURDEN MONITORING WELL
- WEATHERED BEDROCK MONITORING WELL
- BEDROCK MONITORING WELL

**HYDRAULIC TESTING WELLS (WEATHERED BEDROCK)**

- EXTRACTION WELL (6")
- MONITORING / INJECTION WELL (2")
- MONITORING WELL (2")



RACER TRUST  
 PLANTS 2 AND 3  
 LANSING, MICHIGAN

**LOWER 1,4-DIOXANE HYDRAULIC TESTING WELL NETWORK**



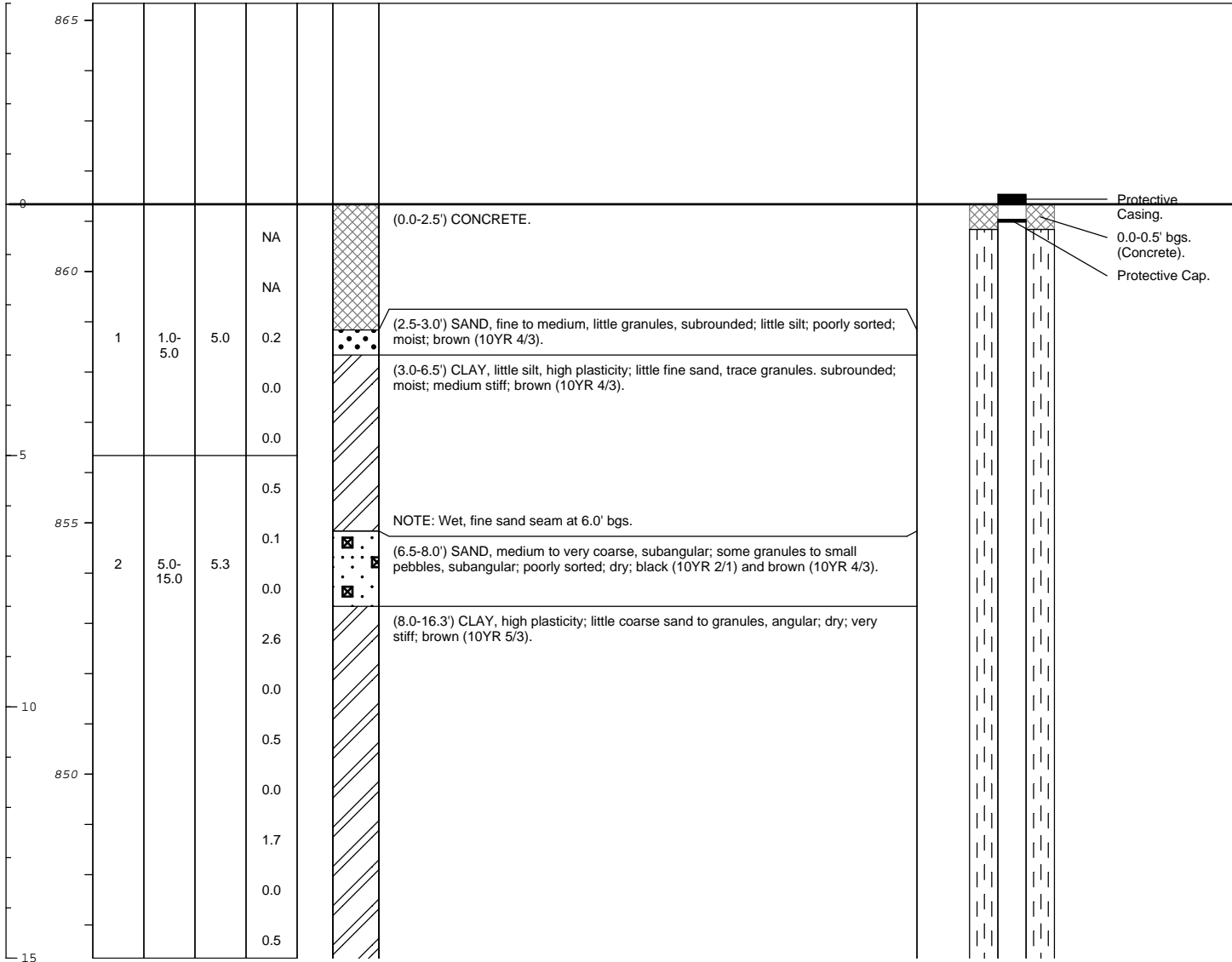



## **Appendix A**

Soil Boring and Well Construction  
Logs

<b>Date Start/Finish:</b> 11.26.12 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Jason Greer <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Hand Auger/5.0' Core Barrel <b>Rig Type:</b> Sonic	<b>Northing:</b> 452849.4616 <b>Easting:</b> 13063775.1 <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 80.0' bgs. <b>Surface Elevation:</b> 861.338989  <b>Descriptions By:</b> Colleen Barton	<b>Well/Boring ID:</b> MW-12-21  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing 2800 West Saginaw Hwy. Lansing, MI 48909
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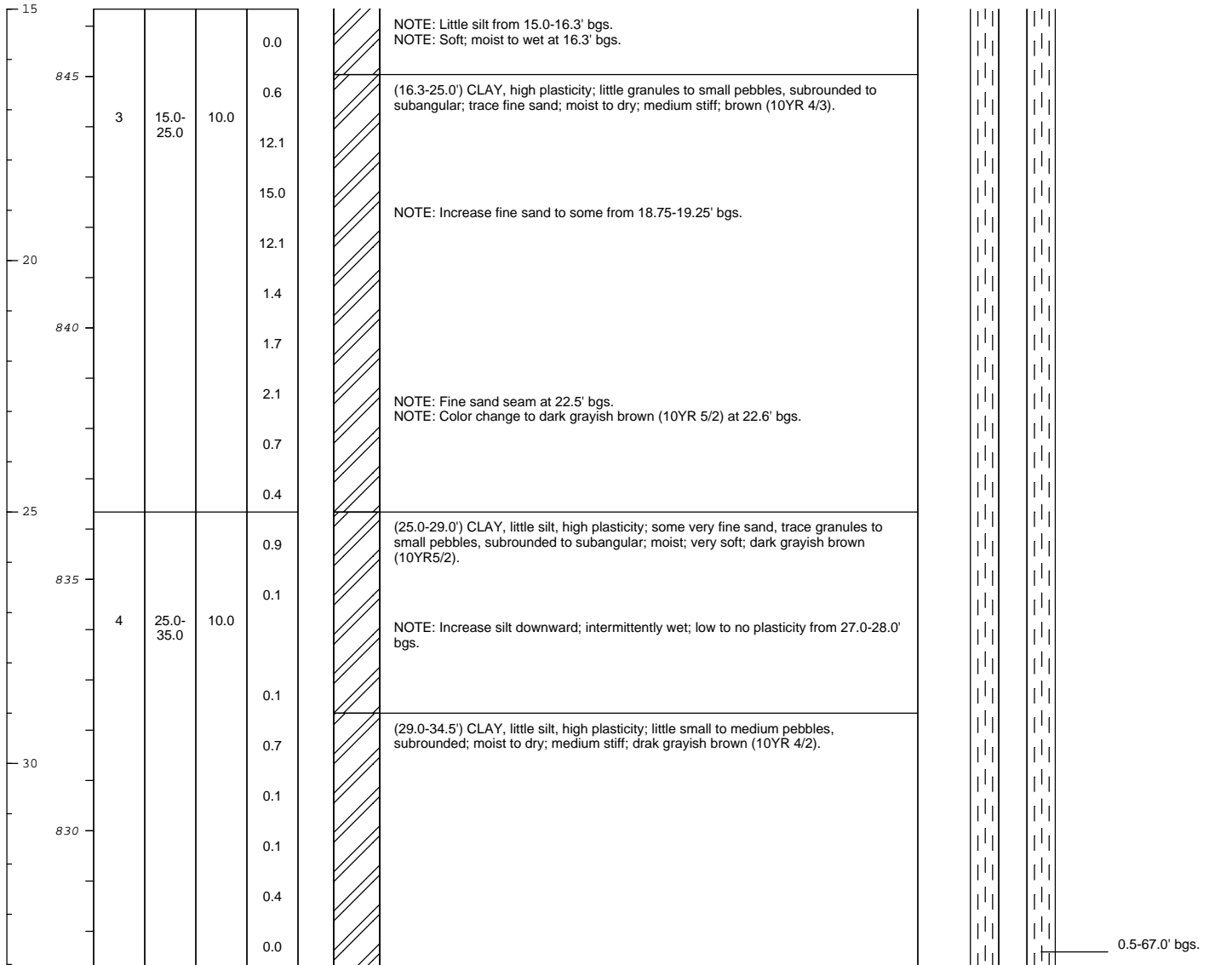
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
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	<b>Remarks:</b> bgs = below ground surface Hand auger to 5.0' bgs. Well screen set at 70.0-75.0' bgs. Groundwater encountered at 6.0', at 16.3', intermittently from 27.0-28.0', from 34.5-37.5' and from 60.0-80.0' bgs. No odor or staining observed.
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<b>Date Start/Finish:</b> 11.26.12 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Jason Greer <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Hand Auger/5.0' Core Barrel <b>Rig Type:</b> Sonic	<b>Northing:</b> 452849.4616 <b>Easting:</b> 13063775.1 <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 80.0' bgs. <b>Surface Elevation:</b> 861.338989  <b>Descriptions By:</b> Colleen Barton	<b>Well/Boring ID:</b> MW-12-21  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing 2800 West Saginaw Hwy. Lansing, MI 48909
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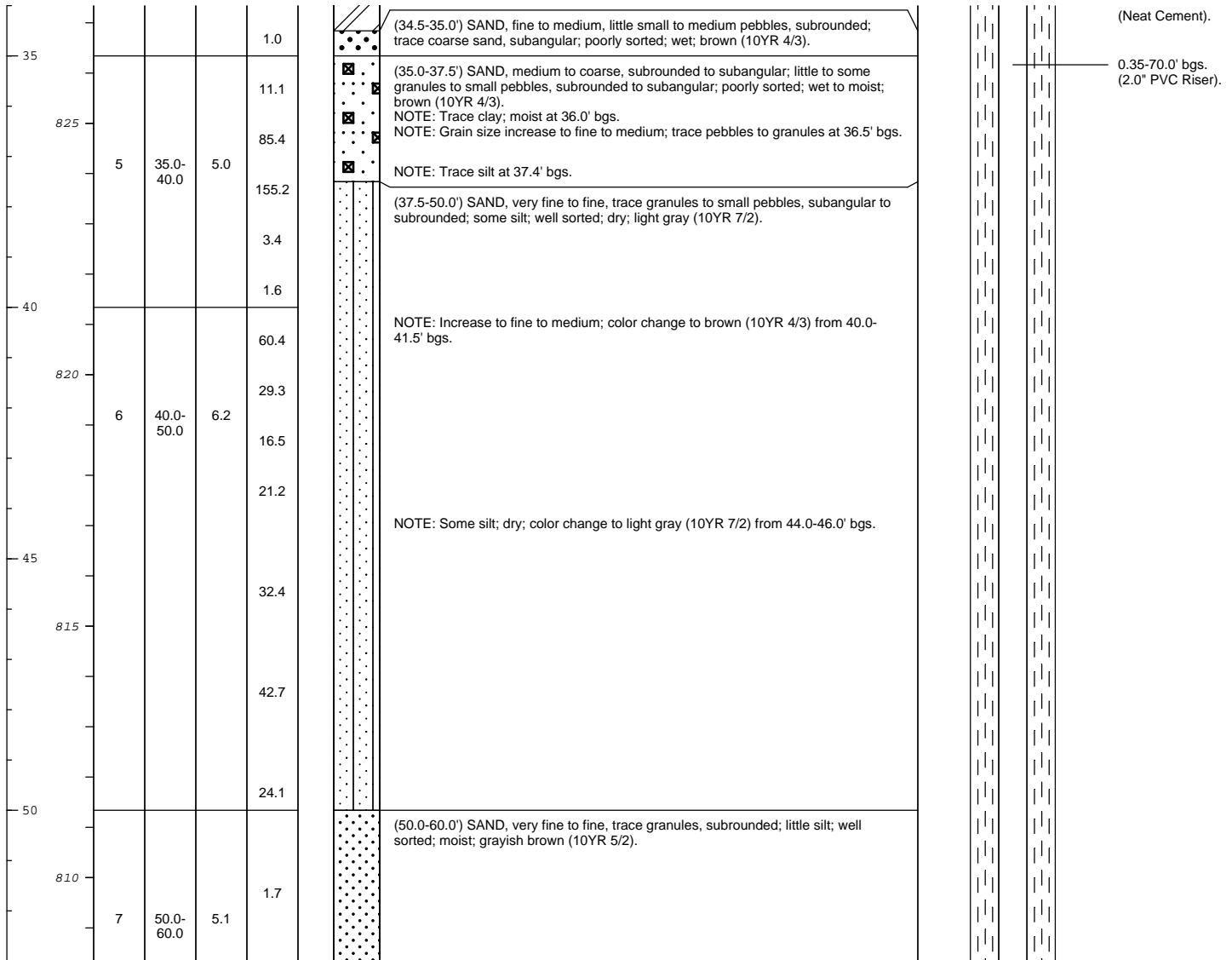
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
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	<b>Remarks:</b> bgs = below ground surface Hand auger to 5.0' bgs. Well screen set at 70.0-75.0' bgs. Groundwater encountered at 6.0', at 16.3', intermittently from 27.0-28.0', from 34.5-37.5' and from 60.0-80.0' bgs. No odor or staining observed.
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<b>Date Start/Finish:</b> 11.26.12 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Jason Greer <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Hand Auger/5.0' Core Barrel <b>Rig Type:</b> Sonic	<b>Northing:</b> 452849.4616 <b>Easting:</b> 13063775.1 <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 80.0' bgs. <b>Surface Elevation:</b> 861.338989  <b>Descriptions By:</b> Colleen Barton	<b>Well/Boring ID:</b> MW-12-21  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing 2800 West Saginaw Hwy. Lansing, MI 48909
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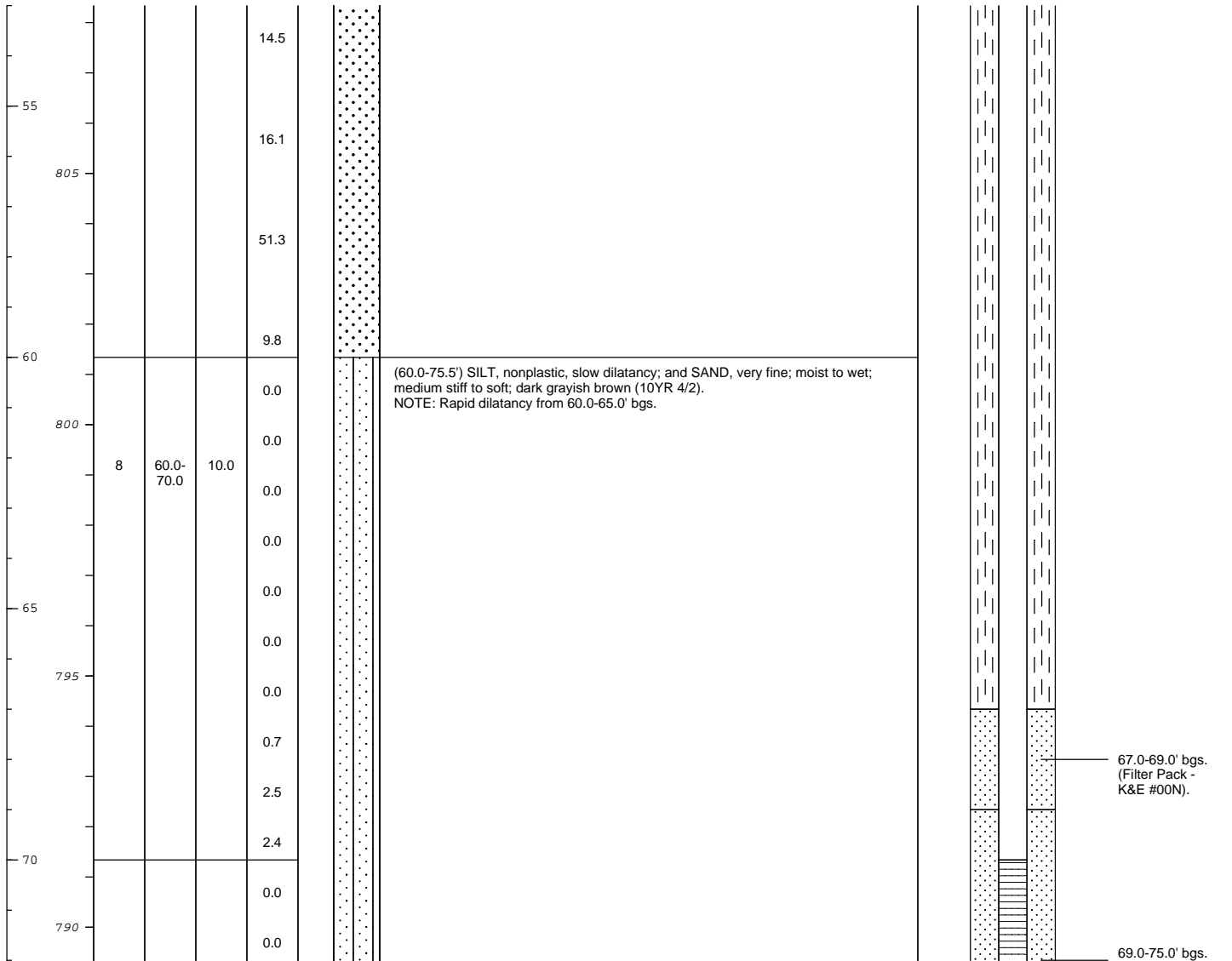
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
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	<b>Remarks:</b> bgs = below ground surface Hand auger to 5.0' bgs. Well screen set at 70.0-75.0' bgs. Groundwater encountered at 6.0', at 16.3', intermittently from 27.0-28.0', from 34.5-37.5' and from 60.0-80.0' bgs. No odor or staining observed.
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<b>Date Start/Finish:</b> 11.26.12 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Jason Greer <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Hand Auger/5.0' Core Barrel <b>Rig Type:</b> Sonic	<b>Northing:</b> 452849.4616 <b>Easting:</b> 13063775.1 <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 80.0' bgs. <b>Surface Elevation:</b> 861.338989  <b>Descriptions By:</b> Colleen Barton	<b>Well/Boring ID:</b> MW-12-21  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing 2800 West Saginaw Hwy. Lansing, MI 48909
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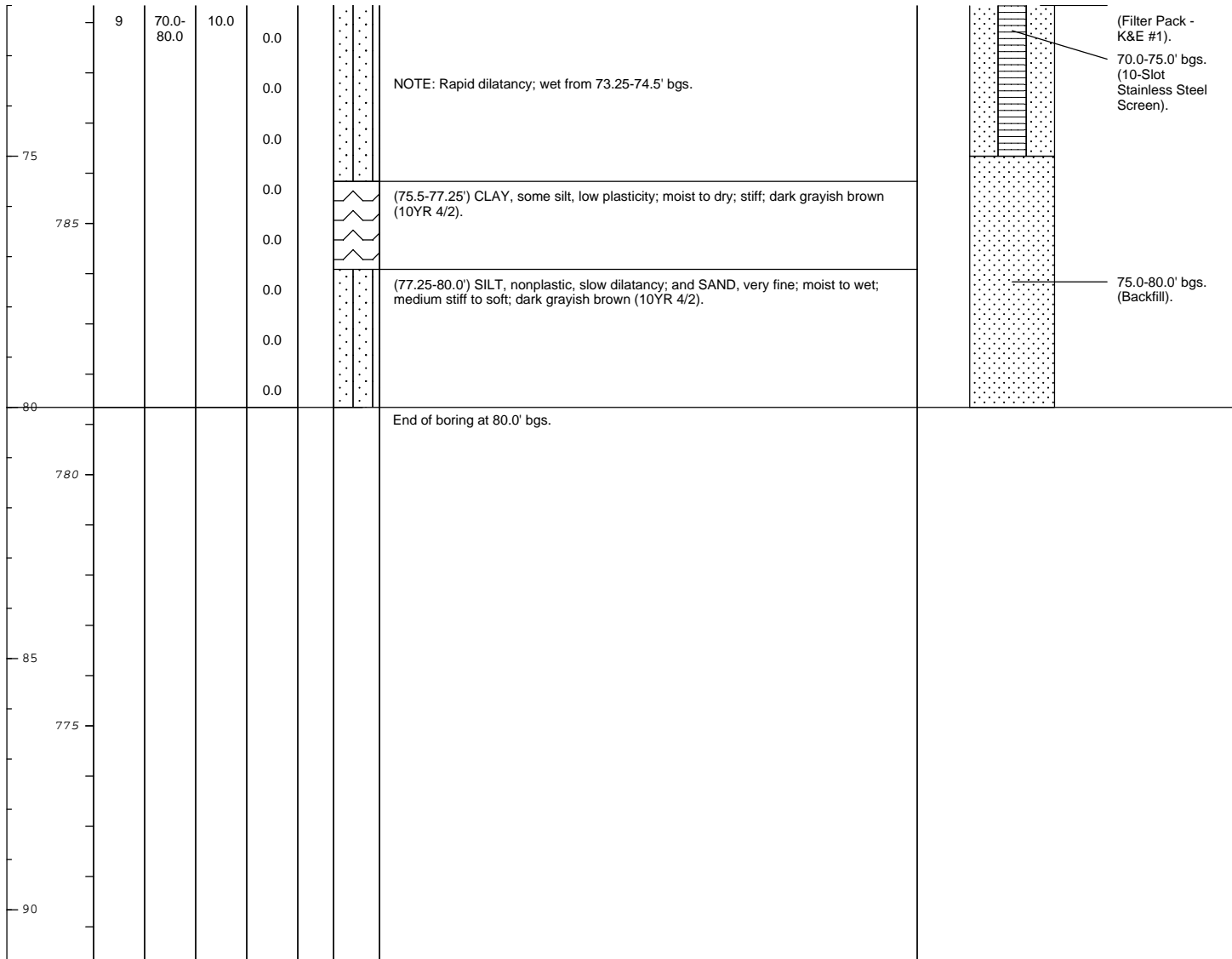
DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
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	<b>Remarks:</b> bgs = below ground surface Hand auger to 5.0' bgs. Well screen set at 70.0-75.0' bgs. Groundwater encountered at 6.0', at 16.3', intermittently from 27.0-28.0', from 34.5-37.5' and from 60.0-80.0' bgs. No odor or staining observed.
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<b>Date Start/Finish:</b> 11.26.12 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Jason Greer <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Hand Auger/5.0' Core Barrel <b>Rig Type:</b> Sonic	<b>Northing:</b> 452849.4616 <b>Easting:</b> 13063775.1 <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 80.0' bgs. <b>Surface Elevation:</b> 861.338989  <b>Descriptions By:</b> Colleen Barton	<b>Well/Boring ID:</b> MW-12-21  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing 2800 West Saginaw Hwy. Lansing, MI 48909
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DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
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	<b>Remarks:</b> bgs = below ground surface Hand auger to 5.0' bgs. Well screen set at 70.0-75.0' bgs. Groundwater encountered at 6.0', at 16.3', intermittently from 27.0-28.0', from 34.5-37.5' and from 60.0-80.0' bgs. No odor or staining observed.
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**Date Start/Finish:** 3/27/13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452839.80  
**Easting:** 13063749.86  
**Casing Elevation:** 864.37

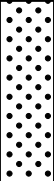



**Well/Boring ID:** MW-13-22

**Client:** RACER

**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

**Borehole Depth:** 94.0' bgs  
**Surface Elevation:** 861.50

**Descriptions By:** C. Barton


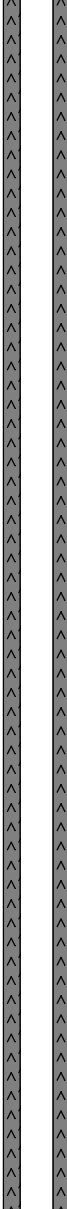





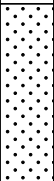
DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
860		1	0.0-5.0	5.0	0.0			(0.0-3.0') SAND, fine to medium, trace small to medium pebbles, subangular; little clay; poorly sorted; moist; dark brown (10YR 3/3). Note: Trace roots, fill.  Note: Some small to medium pebbles from 2.0-3.0' bgs.	
855		2	5.0-7.0	2.0	0.1			(3.0-16.0') CLAY, high plasticity; little granules to small pebbles, subrounded to subangular; little medium sand; moist; medium stiff; dark yellowish brown (10YR 4/4). Note: Fill.  Note: Pocket of small to medium pebbles, subrounded; very dark grayish brown (10YR 3/2); soft; at 11.0' bgs.  Note: Very soft; moist; from 12.0-15.5' bgs.	
850		3	7.0-12.0	2.25	0.3	NA			
845		4	12.0-17.0	5.0	1.3			Note: Color change to dark grayish brown (10YR 4/2) at 15.5' bgs.  (15.0-17.0') CRUSHED CONCRETE, rebar.	


**Remarks:** bgs = below ground surface

Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 77.0' bgs.  
 No staining or odor observed.



<b>Date Start/Finish:</b> 3/27/13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Scott Parks <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic <b>Rig Type:</b> Sonic	<b>Northing:</b> 452839.80 <b>Easting:</b> 13063749.86 <b>Casing Elevation:</b> 864.37  <b>Borehole Depth:</b> 94.0' bgs <b>Surface Elevation:</b> 861.50  <b>Descriptions By:</b> C. Barton	<b>Well/Boring ID:</b> MW-13-22  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	840	5	17.0-27.0	10.0			 (17.0-19.25') CLAY, high plasticity; little granules to small pebbles, subrounded to subangular; little medium sand; moist; soft; dark yellowish brown (10YR 3/2).		
						 (19.25-22.0') PEBBLES, small to very large, subangular; and GRANULES, subangular; little coarse sand, subangular; little clay; poorly sorted; wet; light brownish gray (10YR 6/2).			
						 (22.0-23.0') CLAY, low plasticity, no dilatancy; little to some granules, angular; little fine sand; dry; hard; yellowish brown (10YR 5/6).			
						 (23.0-27.0') CLAY, medium plasticity, no dilatancy; little fine sand; trace granules to small pebbles, angular; moist; medium stiff; dark grayish brown (10YR 4/2).			
						Note: Small to large pebbles, subrounded at base of clay.			
						 (27.0-29.0') SAND, fine to medium, subrounded to subangular; trace granules to small pebbles, subrounded; well sorted; dry to moist; pale brown (10YR 6/3). Note: Coarsening downwards.			
						 (29.0-34.0') SAND, medium to very coarse, subrounded to subangular; some granules, subrounded to subangular; poorly sorted; dry to moist; pale brown (10YR 6/3). Note: Coarsening downwards, increasing very coarse sand to small pebbles, and decreasing medium to coarse.			
						Note: Trace medium to large pebbles, subangular; at 34.0' bgs.			
						 (34.0-39.0') SAND, very fine to fine, trace medium to coarse sand, subrounded; well sorted; dry; pale brown (10YR 6/3).			
35	825	6	27.0-37.0	9.0					

 Infrastructure · Water · Environment · Buildings	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0-5.0' bgs. Groundwater encountered at 77.0' bgs. No staining or odor observed.
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**Date Start/Finish:** 3/27/13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452839.80  
**Easting:** 13063749.86  
**Casing Elevation:** 864.37  
**Borehole Depth:** 94.0' bgs  
**Surface Elevation:** 861.50  
**Descriptions By:** C. Barton

**Well/Boring ID:** MW-13-22  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
40	820	7	37.0-42.0	5.0	4.1			Note: Trace small pebbles, subrounded; moist from 37.0-39.0' bgs.	0.0-85.0' bgs. (Quik Grout) -2.5-89.0' bgs. (Sch. 40 PVC 2.0" Well Casing)
					2.7		Note: Trace silt from 38.0-39.0' bgs.		
5.8		(39.0-41.0') SAND, very fine, little coarse sand to small pebbles, subangular; some silt; poorly sorted; dry; light gray (10YR 4/1).							
5.9									
26.5		(41.0-43.0') SAND, medium to very coarse, subangular; some granules to medium pebbles, subangular; poorly sorted; dry; light gray. Note: Coarsening downwards.							
4.0									
12.0		(43.0-44.0') SILT, low plasticity, slow dilatancy; trace very fine sand; dry; stiff; pale brown (10YR 6/3). Note: Blocky.							
45	815	8	42.0-47.0	5.0	2.0		(44.0-45.5') SAND, very fine; trace silt; well sorted; dry; light gray (10YR 7/2).		
11.2						(45.5-47.0') SILT, low plasticity, rapid dilatancy; little very fine sand; soft; dry; light gray (10YR 7/2).			
50	810	9	47.0-57.0	10.0	16.7		(47.0-51.0') SAND, very fine to fine; trace silt; well sorted; dry; light gray (10YR 7/2). Note: Fining downwards.		
					11.0				
					9.3				
					7.3				
55	805				2.2		(51.0-54.0') SAND, very fine to fine, little coarse to very coarse sand, subangular; trace small pebbles, subangular; poorly sorted; dry; light gray.		
					1.5		Note: Coarsening downwards, some coarse to very coarse sand from 53.0-54.0' bgs.		
					11.0				
					4.4		(54.0-62.0') CLAY, medium to low plasticity, low dilatancy; little fine sand, little small to large pebbles, angular; dry; very stiff; dark grayish brown (10YR 4/2).		
					19.2		Note: Poorly sorted sand; medium; some coarse to very coarse, subangular; little granules to medium pebbles, angular; poorly sorted; dry; from 55.5-56.0' bgs.		
					22.5				

**Remarks:** bgs = below ground surface  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 77.0' bgs.  
 No staining or odor observed.



**Date Start/Finish:** 3/27/13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452839.80  
**Easting:** 13063749.86  
**Casing Elevation:** 864.37  
  
**Borehole Depth:** 94.0' bgs  
**Surface Elevation:** 861.50  
  
**Descriptions By:** C. Barton

**Well/Boring ID:** MW-13-22  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
60								Note: Moist, medium stiff from 57.0-60.0' bgs.	
800		10	57.0-67.0	10.0				Note: Very stiff to hard; dry; from 60.0-62.0' bgs.	
								(62.0-66.0') SILT, low plasticity to nonplastic, slow dilatancy; little very fine sand; moist; very stiff; grayish brown (10YR 5/2).	
65								Note: Rapid dilatancy from 64.0-64.5' bgs. Note: And clay, medium plasticity from 64.5-65.0' bgs. Note: Rapid dilatancy, moist to wet from 65.0-66.0' bgs.	
795								(66.0-67.0') CLAY, little silt, medium to high plasticity, no dilatancy; dry to moist; stiff to very stiff; gray (10YR 5/1).	
								(67.0-76.0') SILT, low plasticity, rapid dilatancy; little very fine sand; moist to wet; stiff; gray (10YR 5/1).  Note: moist, slow dilatancy, from 68.0-76.0' bgs.	
70									
790		11	67.0-77.0	10.0					
								Note: Some very fine sand from 74.0-76.0' bgs.	
75									
785								(76.0-78.0') CLAY and SILT, medium plasticity, slow dilatancy; moist to dry; stiff to medium stiff; gray (10YR 5/1).	

**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 77.0' bgs.  
 No staining or odor observed.



**Date Start/Finish:** 3/27/13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452839.80  
**Easting:** 13063749.86  
**Casing Elevation:** 864.37

**Well/Boring ID:** MW-13-22

**Client:** RACER

**Borehole Depth:** 94.0' bgs  
**Surface Elevation:** 861.50

**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

**Descriptions By:** C. Barton

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
80		12	77.0-87.0	10.0				(78.0-82.0') SILT, little clay, low plasticity to nonplastic, rapid dilatancy; moist to wet; stiff; gray (10YR 5/1).  Note: Sand layers (3 inches thick), very fine to fine; well sorted; moist to wet; dark grayish brown (10YR 4/2); at 79.25' bgs and 81.75' bgs.	
85								(82.0-83.0') CLAY, little silt, high plasticity, low dilatancy; moist; very stiff; grayish brown (10YR 5/2) and reddish gray (5Y 3/2). (83.0-83.2') SAND, medium to coarse, subangular; trace small pebbles, subangular; little clay; poorly sorted; wet; gray (10YR 5/1). (83.2-84.0') CLAY, some silt, low plasticity, slow dilatancy; moist; very stiff; dark gray (10YR 4/1) and reddish gray (5YR 5/2). (84.0-88.0') CLAY, little silt, medium to high plasticity; dry to moist; very stiff; dark gray and reddish gray.	85.0-87.0' bgs. (Choker Sand Pack)
90		13	87.0-94.0	7.0				(88.0-89.0') SAND, very fine; and SILT, nonplastic, no dilatancy; moist to wet; medium stiff; reddish gray. (89.0-94.0') SAND, very fine to fine; trace to little silt; well sorted; moist; light gray (10YR 7/2). Note: Trace bedrock pieces, small to large, subangular.	87.0-94.0' bgs. (Sand Filter Pack - K&E #1) 89.0-94.0' bgs. (10-Slot Stainless Steel Screen)
95								Note: Bedrock encountered at 94.0' bgs End of boring at 94.0' bgs.	

**Remarks:** bgs = below ground surface

Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 77.0' bgs.  
 No staining or odor observed.



**Date Start/Finish:** 3/28/13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452839.34  
**Easting:** 13063975.27  
**Casing Elevation:** 864.31  
  
**Borehole Depth:** 81.5' bgs  
**Surface Elevation:** 861.45  
  
**Descriptions By:** C. Barton

**Well/Boring ID:** MW-13-23  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0								
0.0		1	0.0-5.0	5.0	NA		(0.0-1.0') CONCRETE.		
0.1					0.1		(1.0-5.0') CLAY, high plasticity; and SAND, coarse to very coarse, subangular; some small to large pebbles, angular; medium stiff; moist; brown (10YR 5/3).  Note: Little to some sand and pebbles, color change to grayish green at 2.5' bgs.		
0.1					0.0				
0.0					0.0				
5	-5	2	5.0-7.0	2.0	0.0		(5.0-8.0') CLAY, high plasticity; no dilatancy; little fine sand, little granules to small pebbles, subangular; moist to soft; very dark gray (10YR 3/1). Note: Trace roots.		
0.0					0.0				
0.4					0.4				
0.2					0.2		(8.0-19.5') CLAY, high plasticity, no dilatancy; little medium to very coarse sand, subangular; little small to medium pebbles, subangular; moist; stiff; grayish brown (10YR 5/2)		
0.3					0.3				
10	-10	3	7.0-17.0	10.0	0.0				
0.2					0.2				
0.1					0.1				
0.0					0.0				
15	-15				0.0				
0.0					0.0				


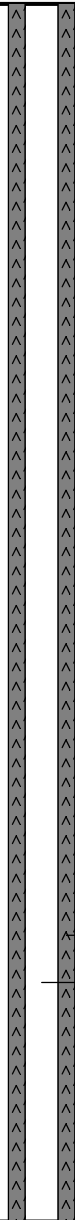




**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 77.0' bgs.  
 No staining or odor observed.

**Date Start/Finish:** 3/28/13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452839.34  
**Easting:** 13063975.27  
**Casing Elevation:** 864.31  
  
**Borehole Depth:** 81.5' bgs  
**Surface Elevation:** 861.45  
  
**Descriptions By:** C. Barton

**Well/Boring ID:** MW-13-23  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction	
20	-20	4	17.0-27.0	10.0	0.2			Note: Dry, very stiff from 18.0-19.5' bgs.		
	0.2						(19.5-21.0') CLAY, low plasticity; and SAND, medium, subrounded; little small to large pebbles, subangular; dry; dark grayish brown (10YR 4/2).			
	0.7						(21.0-27.0') CLAY, high plasticity; little coarse to very coarse sand, subangular; little granules to medium pebbles, subangular; moist; medium stiff; dark grayish brown (10YR 4/2).			
	0.9									
	0.2									
	0.2									
	0.1									
	0.2									
	0.1									
	0.3						Note: Moist sand seam, fine to medium, yellowish brown (10YR 5/6), at 26.75' bgs.			
		5	27.0-37.0	10.0	0.1			(27.0-33.0') SAND, very fine to fine; trace silt; well sorted; dry; yellowish brown (10YR 5/4).		
	2.9									Note: Some very coarse sand to small pebbles, subrounded to subangular, from 29.0-29.5' bgs.
	3.1									Note: Some silt from 30.5-31.0' bgs.
	11.1									Note: Trace small pebbles from 31.0-33.0' bgs.
	1.4									
	3.3									
					5.9			(33.0-38.0') SAND, medium to coarse, subrounded; some very coarse to small pebbles, subrounded; poorly sorted; dry; yellowish brown (10YR 5/4).		
	2.7									
	4.9									
	0.1									Note: Little silt, trace large pebbles, subrounded, at 36.5' bgs.

**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 77.0' bgs.  
 No staining or odor observed.



**Date Start/Finish:** 3/28/13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452839.34  
**Easting:** 13063975.27  
**Casing Elevation:** 864.31  
  
**Borehole Depth:** 81.5' bgs  
**Surface Elevation:** 861.45  
  
**Descriptions By:** C. Barton

**Well/Boring ID:** MW-13-23  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
40 -40		6	37.0-42.0	5.0	3.6			Note: Little very coarse to small pebbles from 36.0-38.0' bgs.	
					2.6		(38.0-42.0') SAND, fine to medium, subrounded; trace granules, subrounded; well sorted; dry; very pale brown (10YR 7/3).		
					5.1				
					12.7		Note: Very fine to fine sand, some silt, at 41.0' bgs.		
45 -45		7	42.0-47.0	5.0	19.5	☒	(42.0-43.0') SAND, medium to very coarse, subrounded; and GRANULES, subrounded; poorly sorted; dry; pale brown (10YR 6/3).		
					1.6		(43.0-44.75') SAND, medium to coarse, subrounded; some very coarse sand, subrounded; poorly sorted; dry; pale brown (10YR 6/3).		
					2.4		(44.75-45.75') SILT, little clay, low plasticity, slow dilatancy; moist to wet; stiff; yellowish brown (10YR 5/4).		
					2.5		(45.75-48.5') SAND, fine to medium, subrounded; little coarse sand, subrounded; poorly sorted; dry; pale brown.		
					2.2				
50 -50		8	47.0-56.0	9.5	2.7				
					1.8		(48.5-51.5') SAND, fine to medium, trace granules to small pebbles, subrounded; well sorted; moist; yellowish brown.		
					1.9				
					3.4				
					2.2		Note: Little to some granules from 49.0-51.0' bgs.		
55 -55					7.3		(51.5-53.0') SAND, very fine to fine; little silt; moist; well sorted; pale brown (10YR 6/3).		
					4.2	☒	(53.0-54.0') SAND, medium to very coarse, subrounded to subangular; and PEBBLES, small to very large, subrounded to subangular; poorly sorted; dry; brown.		
					0.1		(54.0-68.0') SAND, very fine to fine; little silt; well sorted; dry; pale brown (10YR 6/3).		
					1.4				
					6.4				

**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 77.0' bgs.  
 No staining or odor observed.



**Date Start/Finish:** 3/28/13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452839.34  
**Easting:** 13063975.27  
**Casing Elevation:** 864.31  
**Borehole Depth:** 81.5' bgs  
**Surface Elevation:** 861.45  
**Descriptions By:** C. Barton

**Well/Boring ID:** MW-13-23  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction		
60	-60	9	56.0-67.0	10.0	2.4			Note: Trace clay, high plasticity, 61.0' bgs. Note: trace silt at 62.0' bgs. Note: moist at 64.5' bgs. Note: Little silt from 66.0-67.0' bgs.			
65	-65				3.9						
					5.4						
					3.3				64.6-67.0' bgs. (Choker Sand Pack)		
					0.0			(68.0-71.0') SAND, very fine; and SILT, low plasticity, slow dilatancy; moist to wet; stiff; dark grayish brown (10YR 4/2).			
					0.0			Note: Trace granules to small pebbles, subangular, from 69.0-71.0' bgs.			
70	-70				0.3						
					0.0				67.0-76.0' bgs. (Sand Filter Pack - K&E #1)		
		10	67.0-77.0	10.0	0.3			(71.0-72.5') SAND, very fine to fine; little silt; well sorted; moist; dark grayish brown.			
					0.1			(72.5-73.0') SILT, low plasticity, slow dilatancy; little very fine sand; moist; stiff; dark grayish brown.	69.0-74.0' bgs. (10-Slot Stainless Steel Screen)		
					0.4			(73.0-77.0') CLAY, low plasticity; little coarse sand, subangular; little small to very large pebbles, subrounded; dry; very stiff; dark grayish brown.			
75	-75				0.6						
					0.9			Note: Little silt at 75.0' bgs			
					0.7						

**Remarks:** bgs = below ground surface  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 77.0' bgs.  
 No staining or odor observed.



<b>Date Start/Finish:</b> 3/28/13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Scott Parks <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic <b>Rig Type:</b> Sonic	<b>Northing:</b> 452839.34 <b>Easting:</b> 13063975.27 <b>Casing Elevation:</b> 864.31  <b>Borehole Depth:</b> 81.5' bgs <b>Surface Elevation:</b> 861.45  <b>Descriptions By:</b> C. Barton	<b>Well/Boring ID:</b> MW-13-23  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
80	-80	11	77.0-80.0	3.0	0.1		(77.0-78.5') SAND, very fine to fine, subrounded to subangular; and SILT, nonplastic, rapid dilatancy; wet; soft; brown (10YR 4/3).		
					0.		(78.5-80.0') SAND, fine; some silt, nonplastic; well sorted; moist; brown (10YR 4/3). Note: Increase in silt downwards, little clay at 80.0' bgs.		
		12	80.0-81.5	1.5	NA		(80.0-81.5') SANDSTONE, very fine to fine sand; little silt; light gray (10YR 7/1). Note: Bedrock, slightly weathered from 80.0-80.5' bgs.		
85	-85							End of boring at 81.5' bgs.	
90	-90								
95	-95								

	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0-5.0' bgs. Groundwater encountered at 77.0' bgs. No staining or odor observed.
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**Date Start/Finish:** 4-2-13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Chris Barden  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452639.36  
**Easting:** 13063775.23  
**Casing Elevation:** 863.77  
  
**Borehole Depth:** 81.5' bgs  
**Surface Elevation:** 860.49  
  
**Descriptions By:** C. Barton


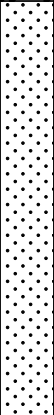




**Well/Boring ID:** MW-13-25  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	860	1	0.0-5.0	5.0	NA			(0.0-2.0') ASPHALT/CONCRETE.	
5	855	2	5.0-7.0	2.0	0.0			(2.0-3.0') SAND, medium to very coarse, subangular; and PEBBLES, small to medium, subangular to subrounded; little clay; poorly sorted; moist; brown (10YR 4/3). (3.0-11.0') CLAY, medium plasticity; little coarse sand, subangular; little medium pebbles, subangular; dry to moist; very stiff; brown (10YR 4/3). Note: High plasticity, moist, at 5.0' bgs. Note: Decrease plasticity at 7.0' bgs.	
10	850	3	7.0-16.0	9.0	0.1			(11.0-16.0') CLAY, medium plasticity; little coarse sand, subangular; little granules to large pebbles, subrounded to subangular; dry to moist; stiff; grayish brown (10YR 5/2).	
15	845				0.0			Note: High plasticity at 15.0' bgs.	
					0.0			(16.0-23.0') CLAY, high plasticity; little granules to small pebbles, subrounded to subangular; moist; stiff; dark grayish brown (10YR 4/2). Note: Till.	

**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 66.0' bgs.  
 No staining or odor observed.



<b>Date Start/Finish:</b> 4-2-13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Chris Barden <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic <b>Rig Type:</b> Sonic	<b>Northing:</b> 452639.36 <b>Easting:</b> 13063775.23 <b>Casing Elevation:</b> 863.77  <b>Borehole Depth:</b> 81.5' bgs <b>Surface Elevation:</b> 860.49  <b>Descriptions By:</b> C. Barton	<b>Well/Boring ID:</b> MW-13-25  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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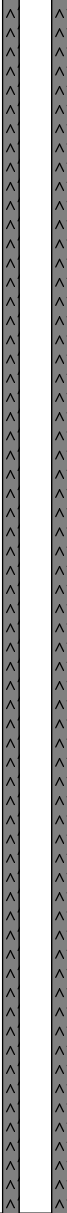

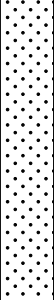
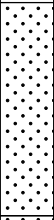
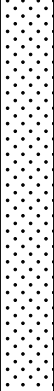

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	840	4	16.0-26.0	10.0	0.1			Note: Sand seam at 19.0' bgs.  Note: Medium stiff at 20.0' bgs.	
25	835				0.0			(23.0-30.0') SAND, fine to medium, subrounded; well sorted; moist to wet; dark yellowish brown (10YR 4/4).  Note: Some clay from 26.0-30.0' bgs.	
30	830	5	26.0-36.0	10.0	0.0			(30.0-30.5') SILT, low plasticity, rapid dilatancy; little very fine sand; wet; medium stiff; gray (10YR 5/1). Note: Laminated.	
					0.3			(30.5-32.0') SAND, very fine to fine; and SILT, nonplastic, rapid dilatancy; wet; gray (10YR 5/1). Note: Interbedded.	
					0.0			(32.0-34.0') CLAY, rapid dilatancy; little fine sand, wet; medium stiff; gray (10YR 5/1). Note: Interbedded.	0.0-62.0' bgs. (Quik Grout)
35	825				0.0			(34.0-41.0') CLAY, high plasticity, no dilatancy; trace to little small to medium pebbles, subrounded to subangular; moist; soft; dark gray (10YR 4/1).	-3.25-67.0' bgs. (Sch. 40 PVC 2.0" Well Casing)
					0.1				

 <p>ARCADIS Infrastructure · Water · Environment · Buildings</p>	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0-5.0' bgs. Groundwater encountered at 66.0' bgs. No staining or odor observed.
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**Date Start/Finish:** 4-2-13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Chris Barden  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452639.36  
**Easting:** 13063775.23  
**Casing Elevation:** 863.77  
  
**Borehole Depth:** 81.5' bgs  
**Surface Elevation:** 860.49  
  
**Descriptions By:** C. Barton

**Well/Boring ID:** MW-13-25  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
40	820	6	36.0-46.0	10.0	0.2			Note: Little pebbles, little coarse sand, at 38.0' bgs.	
					0.0				
					2.6			Note: Medium stiff at 40.0' bgs.	
					3.3				
					0.7			(41.0-46.0') SAND, very fine to fine; well sorted; moist; pale brown (10YR 6/3).	
					0.2				
					0.5				
45	815				1.3				
					0.9				
					0.1			(46.0-49.5') SAND, very fine to fine; little silt, rapid dilatancy; well sorted; wet; grayish brown (10YR 5/2).	
					0.0			Note: Slow dilatancy at 48.0' bgs.	
					0.0				
50	810	7	46.0-56.0	10.0	0.5			(49.5-56.0') SAND, very fine to fine; little to trace silt; well sorted; moist; pale brown (10YR 6/3).	
					0.3				
					2.6				
					0.8				
					0.3				
55	805				2.0				
					0.0			(56.0-60.0') SAND, very fine to fine; and CLAY, medium to high plasticity; poorly sorted; wet; very soft; grayish brown (10YR 6/3).	

**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 66.0' bgs.  
 No staining or odor observed.



**Date Start/Finish:** 4-2-13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Chris Barden  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** 452639.36  
**Eastings:** 13063775.23  
**Casing Elevation:** 863.77  
**Borehole Depth:** 81.5' bgs  
**Surface Elevation:** 860.49  
**Descriptions By:** C. Barton

**Well/Boring ID:** MW-13-25  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction		
60	800	8	56.0-66.0	9.0	0.1						
					0.0						
					0.7						
					0.0					(60.0-61.0') SAND, fine to coarse, subrounded; little small to large pebbles, subrounded; little silt; poorly sorted; moist; brown (10YR 4/3).	
					2.9			(61.0-61.5') CLAY, low plasticity; little fine to medium sand; little small to medium pebbles, subrounded to subangular; moist; stiff; grayish brown (10YR 5/2).			
					0.6			(61.5-66.0') SAND, very fine to fine; well sorted; moist; brown (10YR 5/3).			
65	795				0.6						
					1.2						
					0.7						
					0.0			(66.0-69.0') SILT, low plasticity, rapid dilatancy; little to some very fine sand; wet; medium stiff; dark brownish gray (10YR 4/2).			
					0.0						
					0.0						
					0.1			(69.0-73.0') CLAY, some silt, medium plasticity, slow dilatancy; moist to wet; medium stiff; dark brownish gray (10YR 4/2).			
70	790	9	66.0-76.0	10.0	0.0						
					0.0						
					0.0						
					0.0					(73.0-78.0') SILT, nonplastic, slow to no dilatancy; little very fine to fine sand; moist; stiff; dark brownish gray.  Note: Fine to medium sand pockets, moist, from 73.0-73.5' bgs, 74.5-75.0' bgs, and 75.5-75.75' bgs.	
75	785				0.0						
					0.0						
					0.0						
					0.2						

**Remarks:** bgs = below ground surface  
 Hand auger from 0.0-5.0' bgs.  
 Groundwater encountered at 66.0' bgs.  
 No staining or odor observed.



<b>Date Start/Finish:</b> 4-2-13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Chris Barden <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic <b>Rig Type:</b> Sonic	<b>Northing:</b> 452639.36 <b>Easting:</b> 13063775.23 <b>Casing Elevation:</b> 863.77  <b>Borehole Depth:</b> 81.5' bgs <b>Surface Elevation:</b> 860.49  <b>Descriptions By:</b> C. Barton	<b>Well/Boring ID:</b> MW-13-25  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
80	780	10	76.0-86.0	10.0	0.1			(78.0-85.0') CLAY, some silt, medium plasticity, slow to no dilatancy; moist; stiff; dark gray (10YR 4/1) and reddish gray (5YR 5/2).	74.0-90.0' bgs. (Bentonite Pellets)
					0.0				
					0.0				
85	775				0.0			(85.0-85.5') CLAY, low plasticity; little fine sand, little small pebbles, subangular to subrounded; dry; hard; dark grayish brown (10YR 4/2).	
		11	86.0-90.0	3.0	0.0			(85.5-90.0') SAND, medium, subrounded; little small to very large pebbles, subrounded to subangular; little silt; moist; poorly sorted; gray (10YR 6/1). Note: Appears to be weathered bedrock.	
					0.5				
					0.7				
90	770				NA			End of boring at 90.0' bgs.	
					NA				
					NA				
					NA				
					NA				
95	765				NA				
					NA				

 <p>ARCADIS Infrastructure · Water · Environment · Buildings</p>	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0-5.0' bgs. Groundwater encountered at 66.0' bgs. No staining or odor observed.
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**Date Start/Finish:** 4.18.13 / 4.22.13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Chris Borden  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic/Wire Line Rockcore  
**Rig Type:** Sonic

**Northing:** NA  
**Easting:** NA  
**Casing Elevation:** NA  
  
**Borehole Depth:** 115.0' bgs  
**Surface Elevation:** NA  
  
**Descriptions By:** C. Barton/A. Westhuis

**Well/Boring ID:** MW-13-28  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0								
0.0		1	0.0-5.0	5.0	NA		(0.0'-1.5') CONCRETE		
1.5					0.0		(1.5'-5.0') CLAY, medium to low plasticity; little to some fine sand; little granules to large pebbles, subangular to subrounded; moist; very stiff; brown (10YR 4/3).		
5.0	-5	2	5.0-7.0	2.0	0.0		(5.0'-13.0') CLAY, high plasticity; little fine sand; trace small to medium pebbles, subrounded to subangular; trace silt; moist; stiff; yellowish brown (10YR 5/4) grayish green.		-3.0-99.0' bgs. (4.0" Steel Well Casing)
7.0					0.0		NOTE: Little small to large pebbles, little granules, subangular at 8.0' bgs.		0.0-99.0' bgs. (Neat Cement Slurry)
10.0	-10	3	7.0-17.0	10.0	0.0		(13.0'-18.5') CLAY, high plasticity; little coarse sand to granules, subangular; little fine sand; little small to large pebbles, rounded; trace silt; moist; medium stiff; grayish brown (10YR 5/2).		
15.0	-15				0.0		NOTE: Decrease in fine sand at 15.0'.		

**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0'-5.0' bgs.  
 Groundwater encountered from 27.0'-30.0', 34.0'-36.0', 46.0'-49.5', at 64.0', from 65.0'-69.0' and 89.0'-115.0' bgs.  
 No recovery from 21.0'-27.0' bgs.  
 No staining or odor observed.



**Date Start/Finish:** 4.18.13 / 4.22.13  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Chris Borden  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic/Wire Line Rockcore  
**Rig Type:** Sonic

**Northing:** NA  
**Eastings:** NA  
**Casing Elevation:** NA  
**Borehole Depth:** 115.0' bgs  
**Surface Elevation:** NA  
**Descriptions By:** C. Barton/A. Westhuis

**Well/Boring ID:** MW-13-28  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0.0									
0.0									
20	-20	4	17.0-27.0	4.5				(18.5'-19.0') SILT, no dilatancy; and SAND, very fine to fine; moist; medium stiff; yellowish brown (10YR 5/4). (19.0'-21.0') SAND, fine to medium; little very coarse to granules, subrounded; little silt; poorly sorted; moist; light yellowish brown (10YR 6/4). NOTE: Increase silt to >30% from 20.0'-21.0' bgs. (21.0'-21.5') SAND, fine to coarse, subrounded; little very coarse to granules, subrounded to subangular; little small to medium pebbles, subrounded; poorly sorted; moist; light yellowish brown (10YR 6/4). NOTE: Gray silt layer (~ 1/2') at 21.5' bgs.	
								(21.5'-27.0') No recovery.	
25	-25								
								(27.0'-30.0') CLAY, medium to high plasticity; little fine sand; little silt; little granules to small pebbles; soft; wet to moist; grayish brown (10YR 5/2).	
30	-30	5	27.0-37.0	9.0				(30.0'-34.0') CLAY, high plasticity; little fine sand; little granules to medium pebbles, subrounded to subangular; moist; medium stiff; grayish brown (10YR 5/2).	
								(34.0'-36.0') SAND, medium; little coarse, subangular; trace small pebbles, subrounded; trace very large pebbles, rounded; poorly sorted; moist to wet; brown (10YR 4/3).	

0.0-99.0' bgs. (Neat Cement Slurry)  
 -3.0-99.0' bgs. (4.0" Steel Well Casing)


**Remarks:** bgs = below ground surface  
 Hand auger from 0.0'-5.0' bgs.  
 Groundwater encountered from 27.0'-30.0', 34.0'-36.0', 46.0'-49.5', at 64.0', from 65.0'-69.0' and 89.0'-115.0' bgs.  
 No recovery from 21.0'-27.0' bgs.  
 No staining or odor observed.



<b>Date Start/Finish:</b> 4.18.13 / 4.22.13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Chris Borden <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic/Wire Line Rockcore <b>Rig Type:</b> Sonic	<b>Northing:</b> NA <b>Easting:</b> NA <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 115.0' bgs <b>Surface Elevation:</b> NA  <b>Descriptions By:</b> C. Barton/A. Westhuis	<b>Well/Boring ID:</b> MW-13-28  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0.0									
2.6								(36.0'-39.0') SAND, medium to very coarse, subangular; little granules to small pebbles, subangular to subrounded; poorly sorted; moist; yellowish brown (10YR 5/4).	
0.0									
0.0									
0.5								(39.0'-41.0') SAND, very fine to fine; well sorted; moist; yellowish brown (10YR 5/4).	
0.0									
0.0								(41.0'-42.0') SAND, medium; little fine; little coarse, subrounded; trace small pebbles, subrounded; poorly sorted; moist; light yellowish brown (10YR 6/4).	
0.0									
0.0								(42.0'-46.0') SAND, very fine to fine; trace medium to coarse; well sorted; moist; pale brown (10YR 6/3).	
0.0									
0.0								NOTE: Coarsens downward at 44.0' bgs.	
0.0									
0.0								(46.0'-47.5') SAND, medium to very coarse, subrounded to subangular; little granules to small pebbles, subrounded; trace large pebbles, subrounded; moist to wet; poorly sorted; yellowish brown (10YR 5/4).	
1.3									
5.9								(47.5'-50.0') SAND, fine to medium; some silt, very fine; some medium to very large pebbles, rounded; trace small cobble, rounded; poorly sorted; moist; yellowish brown (10YR 5/4).	
4.7									
0.0								(50.0'-65.0') SAND, very fine to fine; trace silt; trace small pebbles, subrounded; well sorted; moist; pale brown (10YR 6/3).	
0.0									
0.0									
0.0									


-3.0-99.0' bgs.  
(4.0" Steel Well Casing)  
0.0-99.0' bgs.  
(Neat Cement Slurry)

 <p>ARCADIS Infrastructure · Water · Environment · Buildings</p>	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0'-5.0' bgs. Groundwater encountered from 27.0'-30.0', 34.0'-36.0', 46.0'-49.5', at 64.0', from 65.0'-69.0' and 89.0'-115.0' bgs. No recovery from 21.0'-27.0' bgs. No staining or odor observed.
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<b>Date Start/Finish:</b> 4.18.13 / 4.22.13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Chris Borden <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic/Wire Line Rockcore <b>Rig Type:</b> Sonic	<b>Northing:</b> NA <b>Easting:</b> NA <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 115.0' bgs <b>Surface Elevation:</b> NA  <b>Descriptions By:</b> C. Barton/A. Westhuis	<b>Well/Boring ID:</b> MW-13-28  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
55	-55				0.0				
					0.0				
					0.0			NOTE: No pebbles; color change at 57.0'-60.0' to brown (10YR 5/3).	
					0.0				
60	-60	8	57.0-67.0	10.0	0.0				
					0.0				
					0.0				
					0.0				
					0.0			NOTE: Wet at 64.0' bgs.	
65	-65				0.0			(65.0'-67.0') SAND, very fine; some silt, slow dilatancy; well sorted; wet; grayish brown (10YR 5/2). NOTE: Layer of coarse to very coarse sand at 65.0'; some granules to small pebbles, subrounded; poorly sorted; wet; brown (10YR 5/3).	
					0.0				
					0.0			(67.0'-69.0') SILT, slow dilatancy; some very fine sand; moist to wet; medium stiff; grayish brown (10YR 5/2).	
					0.0				
					0.0				
70	-70	9	67.0-77.0	10.0	0.0			(69.0'-79.0') SILT, no dilatancy; little fine sand; moist; medium stiff; dark grayish brown (10YR 4/2).	
					0.0				
					0.0				
					0.0				

-3.0-99.0' bgs.  
(4.0" Steel Well Casing)  
0.0-99.0' bgs.  
(Neat Cement Slurry)

	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0'-5.0' bgs. Groundwater encountered from 27.0'-30.0', 34.0'-36.0', 46.0'-49.5', at 64.0', from 65.0'-69.0' and 89.0'-115.0' bgs. No recovery from 21.0'-27.0' bgs. No staining or odor observed.
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<b>Date Start/Finish:</b> 4.18.13 / 4.22.13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Chris Borden <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic/Wire Line Rockcore <b>Rig Type:</b> Sonic	<b>Northing:</b> NA <b>Easting:</b> NA <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 115.0' bgs <b>Surface Elevation:</b> NA  <b>Descriptions By:</b> C. Barton/A. Westhuis	<b>Well/Boring ID:</b> MW-13-28  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
75	-75				0.0			NOTE: Decrease in sand downward from 73.0' bgs.  NOTE: Drier silt; stiff; at 74.0' bgs.	
80	-80	10	77.0-87.0	10.0	0.0			(79.0'-89.0') SILT, low to no plasticity, slow dilatancy; little clay; moist; stiff; dark grayish brown (10YR 4/2) and reddish gray.  NOTE: No dilatancy at 82.0' bgs.  NOTE: Increase in clay at 84.0'-85.0' bgs.	-3.0-99.0' bgs. (4.0" Steel Well Casing) 0.0-99.0' bgs. (Neat Cement Slurry)
85	-85				0.0			NOTE: No recovery at 87.0'-97.0' bgs but driller encountered weathered bedrock at 90.0' bgs.	
90	-90	11	87.0-97.0	0.0	NA			(89.0'-99.0') SANDSTONE, very fine to fine sand; little silt; well sorted; wet; gray (2.5Y 6/1).	

	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0'-5.0' bgs. Groundwater encountered from 27.0'-30.0', 34.0'-36.0', 46.0'-49.5', at 64.0', from 65.0'-69.0' and 89.0'-115.0' bgs. No recovery from 21.0'-27.0' bgs. No staining or odor observed.
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<b>Date Start/Finish:</b> 4.18.13 / 4.22.13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Chris Borden <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic/Wire Line Rockcore <b>Rig Type:</b> Sonic	<b>Northing:</b> NA <b>Easting:</b> NA <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 115.0' bgs <b>Surface Elevation:</b> NA  <b>Descriptions By:</b> C. Barton/A. Westhuis	<b>Well/Boring ID:</b> MW-13-28  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
95	-95	12	97.0-99.0	0.0	NA				<p>-3.0-99.0' bgs. (4.0" Steel Well Casing) 0.0-99.0' bgs. (Neat Cement Slurry)  99.0-115.5' bgs. (9" Open Borehole)</p>
100-100		13	99.0-106.0	3.75	NA		(99.0'-115.5') SANDSTONE (Grand River FM), very fine to fine sand; trace to little silt; well sorted; wet; gray (2.5Y 6/1).		
105-105		14	106.0-109.0	3.0	NA		NOTE: Multiple natural fractures from 106.1'-107.0' bgs. Few mechanical fractures throughout, most seem to be natural.		
110-110							NOTE: Cross bedding from 110.0'-110.5' bgs. Most fractures show weathering along the fracture plane.		





	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0'-5.0' bgs. Groundwater encountered from 27.0'-30.0', 34.0'-36.0', 46.0'-49.5', at 64.0', from 65.0'-69.0' and 89.0'-115.0' bgs. No recovery from 21.0'-27.0' bgs. No staining or odor observed.
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<b>Date Start/Finish:</b> 4.18.13 / 4.22.13 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Chris Borden <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic/Wire Line Rockcore <b>Rig Type:</b> Sonic	<b>Northing:</b> NA <b>Easting:</b> NA <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 115.0' bgs <b>Surface Elevation:</b> NA  <b>Descriptions By:</b> C. Barton/A. Westhuis	<b>Well/Boring ID:</b> MW-13-28  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
115-115		15	109.0-115.5	5.5	NA				
120-120								End of boring at 115.5' bgs.	
125-125									

	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0'-5.0' bgs. Groundwater encountered from 27.0'-30.0', 34.0'-36.0', 46.0'-49.5', at 64.0', from 65.0'-69.0' and 89.0'-115.0' bgs. No recovery from 21.0'-27.0' bgs. No staining or odor observed.
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<b>Date Start/Finish:</b> 4.23.2013 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Scott Parks <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic <b>Rig Type:</b> Sonic	<b>Northing:</b> NA <b>Easting:</b> NA <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 79.0' bgs <b>Surface Elevation:</b> NA  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> MW-13-29  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0								
		1	0.0-5.0	5.0	0.0		 (0.0'-0.5') ASPHALT (0.5'-2.0') SAND, medium to very coarse, some granules to large pebbles, subrounded; little silt; poorly sorted; dry to moist; yellowish brown (10YR 5/6).		
		2	5.0-7.0	2.0	0.0		 (2.0'-6.0') CLAY, some silt, low plasticity, no dilatancy; little fine to medium sand, subrounded; dry to moist; medium stiff; grayish brown (10YR 5/2). NOTE: Trace medium to large pebbles, subrounded.		
					0.0		 (6.0'-19.0') CLAY, some silt, high plasticity, no dilatancy; trace to little small to very large pebbles, subrounded; some to little fine to medium sand, subrounded; dry to moist; medium stiff to soft; gray (10YR 5/1).	-3.0-68.0' bgs. (Stainless Steel 10 Slot 2.0" Well Casing)	
		3	7.0-17.0	7.0	0.1		 NOTE: (9.0'-10.0') Organic matter, trace small roots and wood; very dark gray (10YR 3/1).	0.0-64.0' bgs. (Neat Cement Slurry)	
-5	-5				0.0				
-10	-10				0.0				
-15	-15				0.1				
					0.3				
					0.1				
					0.0				
					0.1				
					0.1				
					0.0				

	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0'-5.0' bgs. Groundwater encountered from 73.8'-79.0' bgs. No staining or odor observed.
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**Date Start/Finish:** 4.23.2013  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** NA  
**Easting:** NA  
**Casing Elevation:** NA  
  
**Borehole Depth:** 79.0' bgs  
**Surface Elevation:** NA  
  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** MW-13-29  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
0.0									
0.0									
0.0									
20	-20	4	17.0-27.0	9.0				(19.0'-25.0') CLAY, little silt, high plasticity, no dilatancy; trace small to large pebbles, subrounded; little very fine to medium sand, subrounded; moist; stiff to medium stiff; gray (10YR 5/1).	
25	-25							(25.0'-26.0') SAND, fine grained, subrounded; trace to little silt; well sorted; dry to moist; very pale brown (10YR 7/3).	
								(26.0'-27.0') SAND, very fine to fine, subrounded; little silt; well sorted; dry to moist; very pale brown (10YR 7/3).	
								(27.0'-28.0') CLAY, some silt, high plasticity, no dilatancy; little sand, fine to medium, subrounded; trace granules to large pebbles, subrounded; moist; medium stiff; gray (10YR 5/1).	
								(28.0'-31.0') CLAY and SILT, low to non-plastic, no dilatancy; some to little fine to medium sand, subrounded; trace granules to large pebbles, subrounded; dry to moist; very stiff to stiff; gray (10YR 5/1).	
30	-30	5	27.0-37.0	9.0				(31.0'-34.0') SAND, fine grained, subrounded; trace silt; well sorted; dry to moist; very pale brown (10YR 7/3).	
								(34.0'-34.9') CLAY, some silt, low plasticity, no dilatancy; some fine sand, subrounded; little granules to small pebbles, subrounded; moist; stiff to medium stiff; gray (10YR 5/1).	

0.0-64.0' bgs.  
 (Neat Cement Slurry)  
 -3.0-68.0' bgs.  
 (Sch. 40 PVC  
 2.0" Well Casing)

**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0'-5.0' bgs.  
 Groundwater encountered from 73.8'-79.0' bgs.  
 No staining or odor observed.




<b>Date Start/Finish:</b> 4.23.2013 <b>Drilling Company:</b> Boart Longyear <b>Driller's Name:</b> Scott Parks <b>Drilling Method:</b> Hand Auger/Sonic <b>Sampling Method:</b> Sonic <b>Rig Type:</b> Sonic	<b>Northing:</b> NA <b>Easting:</b> NA <b>Casing Elevation:</b> NA  <b>Borehole Depth:</b> 79.0' bgs <b>Surface Elevation:</b> NA  <b>Descriptions By:</b> A. Westhuis	<b>Well/Boring ID:</b> MW-13-29  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3 2801 West Saginaw Lansing, MI 48909
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
39.9					0.2		(34.9'-39.9')	SAND, fine to very fine, subrounded; trace silt; well sorted; dry to moist; very pale brown (10YR 7/3).	
					0.1				
					0.0				
					0.0				
40	-40	6	37.0-47.0	9.0			(39.9'-43.5')	SAND, very fine to medium, subangular; some granules to small pebbles, trace large to very large pebbles, subangular to subrounded; little silt; poorly sorted; dry; light brownish gray (10YR 6/2).	
					0.1				
					0.1				
					0.0				
					0.0				
45	-45						(43.5'-47.0')	SAND, very fine to fine, subrounded; little silt; well sorted; dry; light gray (10YR 7/2).	
					0.1				
					0.0				
					0.0				
					1.2				
					2.3				
50	-50	7	47.0-57.0	9.5			(47.0'-50.0')	SAND, very fine, subrounded; little silt; trace to little granules to small pebbles, subangular to subrounded; poorly sorted; dry; light gray (10YR 7/2).	
					1.1				
					0.2				
					0.1				
					1.3				
							(50.0'-55.0')	SAND, very fine, subrounded; little silt; trace granules, subrounded; well sorted; dry; very pale brown (10YR 8/2).	

0.0-64.0' bgs.  
(Neat Cement Slurry)

-3.0-68.0' bgs.  
(Sch. 40 PVC  
2.0" Well Casing)

	<b>Remarks:</b> bgs = below ground surface  Hand auger from 0.0'-5.0' bgs. Groundwater encountered from 73.8'-79.0' bgs. No staining or odor observed.
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**Date Start/Finish:** 4.23.2013  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** NA  
**Easting:** NA  
**Casing Elevation:** NA

**Well/Boring ID:** MW-13-29

**Client:** RACER

**Borehole Depth:** 79.0' bgs  
**Surface Elevation:** NA

**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

**Descriptions By:** A. Westhuis

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
55	-55				2.2				
					0.1			(55.0'-57.0') SAND, very fine to fine; little silt, subrounded; well sorted; dry; very pale brown (10YR 7/3).	
					0.0				
					0.1			(57.0'-58.5') SAND, very fine to fine; little silt; trace granules to large pebbles, subrounded; poorly sorted; dry; very pale brown (10YR 7/3).	
					0.4			(58.5'-59.0') SILT, non-plastic, no dilatancy; trace to little fine sand; dry; very stiff; gray (10YR 5/1).	
60	-60	8	57.0-67.0	9.0	1.2			(59.0'-62.0') SAND, very fine, subrounded; little silt; well sorted; dry; light gray (10YR 7/2).	0.0-64.0' bgs. (Neat Cement Slurry)
					1.6				
					0.8				-3.0-68.0' bgs. (Sch. 40 PVC 2.0" Well Casing)
					0.4			(62.0'-68.0') SAND, very fine to fine; little silt; trace granules, subrounded; well sorted; dry; very pale brown (10YR 7/3).	
					0.2				
					0.1				
65	-65				0.3				64.0-66.0' bgs. (Choker Sand Pack)
					0.1				
					0.1				
70	-70	9	67.0-77.0	9.0	0.0			(68.0'-73.0') SAND, fine grained, subrounded; well sorted; moist; pale brown (10YR 6/3).	66.0-74.0' bgs. (Sand Filter Pack - K&E #1)
					0.0				
					0.1				68.0-73.0' bgs. (10-Slot Stainless Steel Screen)
					0.1				
					0.0				
					0.0			(73.0'-73.8') CLAY and SILT, low to non-plastic, no dilatancy; some fine sand.	


**Remarks:** bgs = below ground surface  
 Hand auger from 0.0'-5.0' bgs.  
 Groundwater encountered from 73.8'-79.0' bgs.  
 No staining or odor observed.



**Date Start/Finish:** 4.23.2013  
**Drilling Company:** Boart Longyear  
**Driller's Name:** Scott Parks  
**Drilling Method:** Hand Auger/Sonic  
**Sampling Method:** Sonic  
**Rig Type:** Sonic

**Northing:** NA  
**Easting:** NA  
**Casing Elevation:** NA  
  
**Borehole Depth:** 79.0' bgs  
**Surface Elevation:** NA  
  
**Descriptions By:** A. Westhuis

**Well/Boring ID:** MW-13-29  
**Client:** RACER  
  
**Location:** RACER Lansing Plant 3  
 2801 West Saginaw  
 Lansing, MI 48909

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Well/Boring Construction
75	-75	10	77.0-79.0		0.0			subrounded; trace granules to medium pebbles, subrounded; moist; stiff; gray (10YR 5/1).	
	0.0					(73.8'-75.5') SAND, fine to coarse, subrounded; some silt, slow dilatancy; trace granules to very large pebbles, subrounded; poorly sorted; moist to wet; gray (10YR 5/1).			
	0.1					(75.5'-79.0') CLAY and SILT, low to non-plastic, slow dilatancy; trace to little fine to medium sand, subrounded; trace granules to large pebbles, subrounded; moist to wet; stiff; gray (10YR 5/1). NOTE: Small fragments of weathered sandstone.			
	0.1								
80	-80			2.0				End of boring at 79.0' bgs.	
85	-85								
90	-90								

**Remarks:** bgs = below ground surface  
  
 Hand auger from 0.0'-5.0' bgs.  
 Groundwater encountered from 73.8'-79.0' bgs.  
 No staining or odor observed.





<b>Date Start:</b> 11/11/2013 <b>Date Finish:</b> 11/14/2013 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Mike Bond <b>Drilling Method:</b> HA to 6.0'/Sonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 76.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Westhuis	<b>Well/Boring ID:</b> MW-13-42  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Snow, 30 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
					0.0			(16.0'-16.5') PEAT, some organic material; medium stiff; moist; dark brown.		
					0.0			(16.5'-19.5') CLAY, trace silt, high plasticity, no dilatancy; moist; soft; grayish brown (10YR 5/2).		
20	-20	4	17.0-27.0	10.0	0.0		.....	(19.5'-23.5') SAND, medium to coarse, little granules to small pebbles, subround, trace medium to large pebbles, subround; little silt; poorly sorted; wet; light grayish brown (10YR 6/2).		0.0-37.0' bgs. (3.0" Steel Outer Casing)
					0.0			(23.5'-28.0') CLAY, some silt, medium to high plasticity, no dilatancy; little fine sand, trace granules to large pebbles, subround; moist; stiff; pale brown (10YR 6/3).		
30	-30	5	27.0-37.0	10.0	0.0		.....	(28.0'-35.5') SAND, very fine to fine, subround; little silt; well sorted; wet; pale brown (10YR 6/3). NOTE: from 35.0'-35.5', medium to coarse sand.		
					0.0			(35.5'-42.0') CLAY, some silt, medium plasticity, no dilatancy; little fine to medium		3.0' ags-70.0' bgs. (2.0" Sch. 40 PVC Casing)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 0.5'-3.0', 19.5'-23.5' and 28.0'-35.5' bgs.  
 No odor or staining observed.





**Date Start:** 11/11/2013  
**Date Finish:** 11/14/2013  
**Drilling Company:** Cascade  
**Driller's Name:** Mike Bond  
**Drilling Method:** HA to 6.0'/Sonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 76.0  
**Surface Elevation:**  
  
**Descriptions By:** A.Westhuis

**Well/Boring ID:** MW-13-42  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
  
**Weather Conditions:** Snow, 30 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
60	-60	8	57.0-67.0	10.0	0.0			(58.0'-68.0') CLAY and SILT, medium plasticity, no dilatancy; little fine sand, trace granules to large pebbles, subround; moist; stiff; gray (10YR 5/1). NOTE: Glacial Till.		
65	-65				0.0					
70	-70	9	67.0-75.0	7.0	0.0			(68.0'-76.0') SANDSTONE, pulverized with some large fragments, fine grained; light gray (10YR 7/2). NOTE: Grand River Formation.		66.0-67.0' bgs. (Bentonite) 67.0-69.0' bgs. (Filter Pack - K&E #0) 69.0-76.0' bgs. (Filter Pack - K&E #1) 70.0-75.0' bgs. (2.0" 10-Slot Stainless Steel Screen)
75	-75	10	75.0-76.0	1.0	0.0			End of boring at 76.0' bgs.		

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 0.5'-3.0', 19.5'-23.5' and 28.0'-35.5' bgs.  
 No odor or staining observed.



**Date Start:** 10/24/2013  
**Date Finish:** 10/24/2013  
**Drilling Company:** Cascade  
**Driller's Name:** John Roberts  
**Drilling Method:** HA to 6.0'/Sonic  
**Sampling Method:** Sonic continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 12.0  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 79.0  
**Surface Elevation:**  
**Descriptions By:** A.Westhuis

**Well/Boring ID:** MW-13-43  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Cloudy, 40 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
0.0 - 6.0		1	0.0-6.0	6.0	NA		(0.0'-0.5') CONCRETE.			0.0-1.0' bgs. (Concrete)
6.0 - 10.0		2	6.0-10.0	2.0	NA		(0.5'-9.5') SAND, very fine to coarse, trace granules to large pebbles, subround; some silt; poorly sorted; moist; brownish yellow (10YR 6/8). NOTE: Fill Material.			
10.0 - 12.0					NA		(9.5'-12.0') CLAY, some silt; high plasticity, no dilatancy; little very fine to fine sand; trace granules, subround; moist; soft; dark grayish brown (10YR 4/2) with brownish yellow (10YR 6/8) mottling.			
12.0 - 15.0					NA		(12.0'-15.0') SAND, very fine to fine, subround; and SILT, low plasticity, rapid dilatancy; wet; well sorted; dark gray (10YR 4/1).			
15.0 - 20.0		3	10.0-20.0	8.0	NA		(15.0'-20.0') SAND, fine to coarse, subround; some silt; poorly sorted; wet; grayish brown (10YR 5/2).			

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0'-20.0' bgs.  
 No odor or staining observed.



**Date Start:** 10/24/2013  
**Date Finish:** 10/24/2013  
**Drilling Company:** Cascade  
**Driller's Name:** John Roberts  
**Drilling Method:** HA to 6.0'/Sonic  
**Sampling Method:** Sonic continous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 12.0  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 79.0  
**Surface Elevation:**  
**Descriptions By:** A.Westhuis

**Well/Boring ID:** MW-13-43  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Cloudy, 40 F


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20				0.0					
25	-25	4	20.0-30.0	9.0	0.0			(20.0'-27.5') CLAY, some silt, medium plasticity, no dilatancy; little to some fine sand, trace granules to large pebbles, subround; moist; medium stiff; grayish brown (10YR 5/2). NOTE: Glacial Till.		
					0.0			(27.5'-28.0') SAND, very fine to fine, subround; and SILT; well sorted; moist; grayish brown (10YR 5/2).		
30	-30				0.0			(28.0'-43.0') CLAY and SILT, medium plasticity, no dilatancy; little fine sand, trace granules to large pebbles, subround; moist; stiff to very stiff; gray (10YR 5/1). NOTE: Glacial Till.		
35	-35	5	30.0-40.0	10.0	0.0					1.0-68.0' bgs. (Grout)
					0.0					0.0-72.0' bgs. (2.0" PVC Riser)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0'-20.0' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 10/24/2013 <b>Date Finish:</b> 10/24/2013 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> John Roberts <b>Drilling Method:</b> HA to 6.0'/Sonic <b>Sampling Method:</b> Sonic continous <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 12.0 <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 79.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Westhuis	<b>Well/Boring ID:</b> MW-13-43  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Cloudy, 40 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
40	-40				0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
45	-45	6	40.0-50.0	10.0	2.1			(43.0'-60.0') SAND, very fine to fine, subround; some silt; well sorted; dry; light brownish gray (10YR 6/2).		
					2.3					
					1.1					
					0.8					
					0.4					
					0.2					
					0.3					
50	-50				0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
55	-55	7	50.0-60.0	5.0	0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					
					0.0					

	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 12.0'-20.0' bgs. No odor or staining observed.
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**Date Start:** 10/24/2013  
**Date Finish:** 10/24/2013  
**Drilling Company:** Cascade  
**Driller's Name:** John Roberts  
**Drilling Method:** HA to 6.0'/Sonic  
**Sampling Method:** Sonic continuous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 12.0  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 79.0  
**Surface Elevation:**  
  
**Descriptions By:** A.Westhuis

**Well/Boring ID:** MW-13-43  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
  
**Weather Conditions:** Cloudy, 40 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
60	-60				0.0					
65	-65	8	60.0-70.0	9.0	0.0			(60.0'-77.0') CLAY and SILT, medium to low plasticity, no dilatancy; little to some fine sand, trace granules to very large pebbles, subround; moist; stiff; dark gray (10YR 4/1). NOTE: Glacial Till.		
70	-70				0.0			NOTE: Little small to very large fine sandstone fragments near 70.0' bgs.		68.0-69.0' bgs. (Bentonite)
75	-75	9	70.0-79.0	9.0	0.0					69.0-71.0' bgs. (Filter Pack - K&E #0)
					0.0					71.0-77.0' bgs. (Filter Pack - K&E #1)
					0.0					72.0-77.0' bgs. (2.0" 10-Slot Stainless Steel Screen)

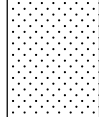
**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0'-20.0' bgs.  
 No odor or staining observed.



**Date Start:** 10/24/2013  
**Date Finish:** 10/24/2013  
**Drilling Company:** Cascade  
**Driller's Name:** John Roberts  
**Drilling Method:** HA to 6.0'/Sonic  
**Sampling Method:** Sonic continous  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 12.0  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Eastng:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 79.0  
**Surface Elevation:**  
  
**Descriptions By:** A.Westhuis

**Well/Boring ID:** MW-13-43  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
  
**Weather Conditions:** Cloudy, 40 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
					0.0			(77.0'-77.5') SANDSTONE and SHALE, pulverized with little fragments.		
					0.0			(77.5'-79.0') SHALE with trace sandstone fragments. NOTE: Saginaw Formation.		
								End of boring at 79.0' bgs.		
80	-80									
85	-85									
90	-90									
95	-95									

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0'-20.0' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 10/28/2013 <b>Date Finish:</b> 11/5/2013 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Scott Parks <b>Drilling Method:</b> HA to 6.0'/Sonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Eastings:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 115.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Westhuis	<b>Well/Boring ID:</b> MW-13-44  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Cloudy, 40 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
0.5		1	0.0-6.0	6.0	NA		(0.0'-0.5') CONCRETE.			
0.5					NA			(0.5'-10.0') SAND, very fine to coarse, trace granules to large pebbles, subround; some silt; poorly sorted; moist to wet; brownish yellow (10YR 6/8). NOTE: Fill material.		
10		2	6.0-10.0	4.0	NA					
10					NA					
10					NA					
10					NA					
10.1		3	10.0-17.0	7.0	0.0		(10.0'-13.0') CLAY, some silt, high plasticity, no dilatancy; little very fine to fine sand, trace granules, subround; most; medium stiff to soft; dark grayish brown (10YR 4/2) with brownish yellow mottling (01YR 6/8).			
13.0					0.1			(13.0'-16.0') SAND, very fine to fine, subround; and SILT, low plasticity to non-plastic, rapid dilatancy; wet; well sorted; dark gray (10YR 4/1).		
16.0					0.0					
16.0					0.0					
16.0					0.0		(16.0'-19.0') SAND, very fine to coarse, subround; and SILT, non-plastic; poorly sorted; grayish brown (10YR 5/2).			
16.0					0.0					

**Remarks:** bgs = below ground surface  
Groundwater encountered from 0.5'-10.0', 13.0'-16.0' and 24.0'-24.5' bgs.  
No odor or staining observed.



<b>Date Start:</b> 10/28/2013 <b>Date Finish:</b> 11/5/2013 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Scott Parks <b>Drilling Method:</b> HA to 6.0'/Sonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 115.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Westhuis	<b>Well/Boring ID:</b> MW-13-44  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Cloudy, 40 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20	4	17.0-27.0	9.0	0.0			(19.0'-24.0') CLAY, some silt, medium to high plasticity, no dilatancy; little fine sand, trace granules to pebbles, subround; moist; stiff; grayish brown (10YR 5/2). NOTE: Glacial Till.		
25	-25				0.0			(24.0'-24.5') SAND, very fine to coarse, trace granules, subround; some silt; poorly sorted; moist to wet; grayish brown (10YR 5/2).		
30	-30	5	27.0-37.0	10.0	0.0			(24.5'-40.0') CLAY and SILT, medium plasticity, no dilatancy; little fine sand, trace granules, subround; moist; stiff; gray (10YR 5/1). NOTE: Glacial Till.		
35	-35				0.0					

 Infrastructure · Water · Environment · Buildings	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 0.5'-10.0', 13.0'-16.0' and 24.0'-24.5' bgs. No odor or staining observed.
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**Date Start:** 10/28/2013  
**Date Finish:** 11/5/2013  
**Drilling Company:** Cascade  
**Driller's Name:** Scott Parks  
**Drilling Method:** HA to 6.0'/Sonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 115.0  
**Surface Elevation:**  
  
**Descriptions By:** A.Westhuis

**Well/Boring ID:** MW-13-44  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
  
**Weather Conditions:** Cloudy, 40 F


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
40	-40	6	37.0-47.0	10.0	0.0					
45	-45				0.0			(40.0'-59.0') SAND, very fine to fine, subround; some silt; well sorted; dry; light brownish gray (10YR 6/2).		
50	-50	7	47.0-57.0	10.0	0.0					
55	-55				0.0					

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 0.5'-10.0', 13.0'-16.0' and 24.0'-24.5' bgs.  
 No odor or staining observed.




<b>Date Start:</b> 10/28/2013 <b>Date Finish:</b> 11/5/2013 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Scott Parks <b>Drilling Method:</b> HA to 6.0'/Sonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 115.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Westhuis	<b>Well/Boring ID:</b> MW-13-44  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Cloudy, 40 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
60	-60	8	57.0-67.0	10.0	0.0			(59.0'-77.0') CLAY and SILT, medium to low plasticity, no dilatancy; little to some fine sand, trace granules to very large pebbles, subround; moist; stiff; dark gray (10YR 4/1). NOTE: Glacial Till. NOTE: Trace large sandstone fragments.		
65	-65				0.0					
70	-70	9	67.0-77.0	10.0	0.0					
75	-75				0.0					

	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 0.5'-10.0', 13.0'-16.0' and 24.0'-24.5' bgs. No odor or staining observed.
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<b>Date Start:</b> 10/28/2013 <b>Date Finish:</b> 11/5/2013 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Scott Parks <b>Drilling Method:</b> HA to 6.0'/Sonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 115.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Westhuis	<b>Well/Boring ID:</b> MW-13-44  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Cloudy, 40 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
80 - 80		10	70.0-80.0	3.0	0.0			(77.0'-81.0') SHALE, with trace fine sandstone laminations; very dark gray (10YR 3/1).		
					0.0					
					0.0					
		11	80.0-85.0	5.0	0.0			(81.0'-83.0') SANDSTONE, fine grained; light gray (10YR 7/1).		
					0.0					
					0.0					
85 - 85					0.0			(83.0'-85.0') SHALE, with some fine sandstone laminations; very dark gray (10YR 3/1).		
					0.0					
					0.0					
		12	85.0-92.0	7.0	0.0			(85.0'-115.0') SANDSTONE, with black shale inclusions. NOTE: Large sandstone cores more prevalent.		
					0.0					
					0.0					
					0.0					
90 - 90					0.0					
					0.0					
					0.0					
		13	92.0-96.0	4.0	0.0					
					0.0					
					0.0					
95 - 95					0.0					
					0.0					
					0.0					
					NA					

	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 0.5'-10.0', 13.0'-16.0' and 24.0'-24.5' bgs. No odor or staining observed.
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**Date Start:** 10/28/2013  
**Date Finish:** 11/5/2013  
**Drilling Company:** Cascade  
**Driller's Name:** Scott Parks  
**Drilling Method:** HA to 6.0'/Sonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Eastings:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 115.0  
**Surface Elevation:**  
  
**Descriptions By:** A.Westhuis

**Well/Boring ID:** MW-13-44  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
  
**Weather Conditions:** Cloudy, 40 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
100-100		14	96.0-115.0	0.0	NA					
					NA					
					NA					
					NA					
					NA					
					NA					
105-105					NA					
					NA					
					NA					
					NA					
					NA					
110-110					NA					
					NA					
					NA					
					NA					
					NA					
115-115					NA					
								End of boring at 115.0' bgs.		


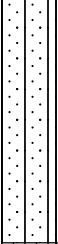
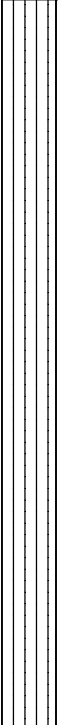
96.0-115.0' bgs.  
(3.0" Open Hole)




**Remarks:** bgs = below ground surface  
 Groundwater encountered from 0.5'-10.0', 13.0'-16.0' and 24.0'-24.5' bgs.  
 No odor or staining observed.




<b>Date Start:</b> 11/18/2013 <b>Date Finish:</b> 11/18/2013 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Mike Bond <b>Drilling Method:</b> HA to 6.0'/Sonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 22.0 <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Eastings:</b> <b>Casing Elevation:</b>  <b>Borehole Depth (ft. bgs.):</b> 77.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Westhuis	<b>Well/Boring ID:</b> MW-13-45 <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Sunny, 30 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20	4	17.0-27.0	10.0	0.0					
					0.0			(22.0'-26.0') SAND, very fine to fine, subround; trace granules to medium pebbles, subround; and SILT, medium plasticity, slow dilatancy; wet; poorly sorted; grayish brown (10YR 5/2).	▼	
25	-25				0.0			(26.0'-38.0') SILT, some clay, low plasticity to non-plastic, no dilatancy; little very fine to medium sand, trace granules to large pebbles, subround; moist; stiff; gray (10YR 5/1). NOTE: Glacial Till.		
30	-30	5	27.0-37.0	8.0	0.0					
35	-35				0.0					
					0.0					0.0-72.0' bgs. (2.0" Sch. 40 PVC Casing)

 <p>ARCADIS Infrastructure · Water · Environment · Buildings</p>	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 22.0'-26.0' bgs. No odor or staining observed.
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<b>Date Start:</b> 11/18/2013 <b>Date Finish:</b> 11/18/2013 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Mike Bond <b>Drilling Method:</b> HA to 6.0'/Sonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> 22.0 <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b>  <b>Borehole Depth (ft. bgs.):</b> 77.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Westhuis	<b>Well/Boring ID:</b> MW-13-45 <b>Client:</b> RACER <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Sunny, 30 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
40	-40	6	37.0-47.0	10.0	0.0		(38.0'-49.0') SAND, very fine to medium, subround; trace silt; poorly sorted; dry to moist; light brownish gray (10YR 6/2).			
					0.1					
					0.1					
					0.0					
					0.2					
					0.1					
45	-45				0.1			NOTE: Small to large pebbles from 44.0-44.5' bgs.		
					0.1					
					0.0					
					0.0					
50	-50	7	47.0-57.0	10.0	0.0		(49.0'-51.5') CLAY, some silt, medium plasticity, no dilatancy; little fine sand, subround; trace small to large pebbles, subround; moist; medium stiff; gray (10YR 5/1). NOTE: Glacial Till.			
					0.1					
					0.0					
					0.0					
					0.0					
55	-55				0.0			(51.5'-58.0') SAND, fine to medium, subround; trace silt; well sorted; dry; grayish brown (10YR 5/2).		
					0.1					
					0.0					
					0.0					
					0.0					
					0.0					

 Infrastructure · Water · Environment · Buildings	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 22.0'-26.0' bgs. No odor or staining observed.
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**Date Start:** 11/18/2013  
**Date Finish:** 11/18/2013  
**Drilling Company:** Cascade  
**Driller's Name:** Mike Bond  
**Drilling Method:** HA to 6.0'/Sonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** 22.0  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:**  
**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**  
**Descriptions By:** A.Westhuis

**Well/Boring ID:** MW-13-45  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Sunny, 30 F


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
60	-60	8	57.0-67.0	10.0	0.0			(58.0'-68.0') SILT, trace clay, non-plastic, no dilatancy; little very fine to fine sand; trace small to large pebbles, subround; stiff; gray (10YR 5/1).		
					0.0			NOTE: Trace small to large fragments of fine grained sandstone at 61.0' bgs.		
		9	67.0-69.0	2.0	0.0			(68.0'-77.0') SANDSTONE, very fine to fine grained, subround; well sorted; light gray (10YR 7/1).		68.0-69.0' bgs. (Bentonite)
70	-70	10	69.0-77.0	8.0	0.0					69.0-71.0' bgs. (Filter Pack - K&E #0)
					0.0					69.0-77.0' bgs. (Filter Pack - K&E #1)
75	-75				0.0					72.0-77.0' bgs. (2.0" 10-Slot Stainless Steel Screen)
					0.0			End of boring at 77.0' bgs.		

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 22.0'-26.0' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 9/3/2014 <b>Date Finish:</b> 9/3/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 78.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> J.Ness	<b>Well/Boring ID:</b> PW-14-01  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Sunny 75 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
0.0		1	0.0-7.0	2.0	NA			(0.0'-1.0') CONCRETE.		
1.0					--			(1.0'-8.0') SAND, very fine; little small to medium pebbles, subangular to subround; and SILT, little clay, non-plastic, rapid dilatancy; poorly sorted; dry; pale brown (10YR 6/3). Note: FILL.		
2.0					--					
3.0					0.0					
4.0					--					
5.0					--					
6.0					--					
7.0					0.0			(8.0'-8.5') SAND, fine to medium; little medium pebbles, round; trace clay; poorly sorted; moist; black (10YR 2/1).		
8.0					0.0			(8.5'-11.0') Organic debris, wood; little clay.		
9.0					0.0					
10.0		2	7.0-17.0	5.4	0.0			(11.0'-17.5') CLAY, little silt, high plasticity, slow dilatancy; moist; very soft; gray (2.5YR 5/1).		
11.0					0.0					
12.0					0.0					
13.0					0.0					
14.0					0.0					
15.0					0.0					
16.0					0.0					
17.0					0.0					
18.0					0.0					
19.0					0.0					
20.0					0.0					
21.0					0.0					
22.0					0.0					
23.0					0.0					
24.0					0.0					
25.0					0.0					
26.0					0.0					
27.0					0.0					
28.0					0.0					
29.0					0.0					
30.0					0.0					
31.0					0.0					
32.0					0.0					
33.0					0.0					
34.0					0.0					
35.0					0.0					
36.0					0.0					
37.0					0.0					
38.0					0.0					
39.0					0.0					
40.0					0.0					
41.0					0.0					
42.0					0.0					
43.0					0.0					
44.0					0.0					
45.0					0.0					
46.0					0.0					
47.0					0.0					
48.0					0.0					
49.0					0.0					
50.0					0.0					

	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 29.0'-32.5' bgs. No odor or staining observed.
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<b>Date Start:</b> 9/3/2014 <b>Date Finish:</b> 9/3/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 78.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> J.Ness	<b>Well/Boring ID:</b> PW-14-01  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Sunny 75 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20 -20		3	17.0-27.0	9.2				(17.5'-19.5') CLAY, high plasticity, no dilatancy; some fine to medium sand, little small to large pebbles, round to subround; moist; very soft; gray brown (10YR 5/2).		
								(19.5'-29.0') CLAY, high plasticity, no dilatancy; little granules to large pebbles, round to subangular; trace fine sand; moist; soft; gray brown (10YR 5/2). Note: Glacial till.		
25 -25										
30 -30		4	27.0-37.0	10.0				(29.0'-32.5') SAND, fine; trace very coarse sand to granules; trace silt; well sorted; wet; gray (10YR 6/1).		
35 -35								(32.5'-42.0') CLAY, high plasticity, no dilatancy; little very coarse sand to granules, round to subround; trace medium pebbles, subround; moist; medium stiff; gray (10YR 6/1).		



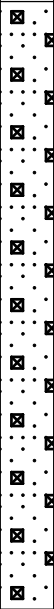
0.0-66.5' bgs.  
(Bentonite Grout)  
3.0' ags - 71.6' bgs. (6" Well Riser)

	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 29.0'-32.5' bgs. No odor or staining observed.

**Date Start:** 9/3/2014  
**Date Finish:** 9/3/2014  
**Drilling Company:** Cascade  
**Driller's Name:**  
**Drilling Method:** Continuous  
**Sampling Method:** 10', 5" core barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 78.0' bgs.  
**Surface Elevation:**  
**Descriptions By:** J.Ness

**Well/Boring ID:** PW-14-01  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Sunny 75 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
40	-40	5	37.0-47.0	8.6						
45	-45							(42.0'-47.0') SAND, fine; well sorted; dry; gray (10YR 6/1).		
50	-50	6	47.0-57.0	10.0				(47.0'-57.0') SAND, very fine; and PEBBLES, granules to medium, subangular to angular; trace coarse sand, round; trace large pebbles, subround; trace silt; poorly sorted; dry; gray (10YR 5/1).		
55	-55									


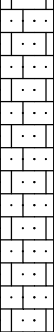
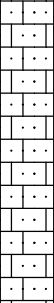
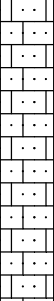
**Remarks:** bgs = below ground surface  
 Groundwater encountered from 29.0'-32.5' bgs.  
 No odor or staining observed.



**Date Start:** 9/3/2014  
**Date Finish:** 9/3/2014  
**Drilling Company:** Cascade  
**Driller's Name:**  
**Drilling Method:** Continuous  
**Sampling Method:** 10', 5" core barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 78.0' bgs.  
**Surface Elevation:**  
**Descriptions By:** J.Ness

**Well/Boring ID:** PW-14-01  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Sunny 75 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
60	-60	7	57.0-62.0	5.0	0.0			(57.0'-61.5') CLAY, medium plasticity, no dilatancy; trace fine sand; little very coarse sand to small pebbles; dry; hard; very dark gray (10YR 3/1).		
65	-65	8	62.0-67.0	5.0	0.0			(61.5'-78.0') SANDSTONE, weathered. Note: Interbedded shale.		
70	-70	9	67.0-72.0	5.0	0.0					66.5-67.5' bgs. (Bentonite)
75	-75	10	72.0-78.0	5.0	0.0					67.5-68.5' bgs. (Choaker Sand - K&E #00)
										68.5-76.8' bgs. (Filter Pack - K&E #1)
										71.6-76.8' bgs. (6.0" 10-Slot Stainless Steel Screen).

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 29.0'-32.5' bgs.  
 No odor or staining observed.



**Date Start:** 9/3/2014  
**Date Finish:** 9/3/2014  
**Drilling Company:** Cascade  
**Driller's Name:**  
**Drilling Method:** Continuous  
**Sampling Method:** 10', 5" core barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 78.0' bgs.  
**Surface Elevation:**  
**Descriptions By:** J.Ness

**Well/Boring ID:** PW-14-01  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Sunny 75 F


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
					0.0					
								End of boring at 78.0' bgs.		
80	-80									
85	-85									
90	-90									
95	-95									



**Remarks:** bgs = below ground surface  
 Groundwater encountered from 29.0'-32.5' bgs.  
 No odor or staining observed.

<b>Date Start:</b> 9/5/2014 <b>Date Finish:</b> 9/8/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 82.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> J.Ness	<b>Well/Boring ID:</b> PW-14-02  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Sunny 85 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
0.0		1	0.0-7.0	7.0	NA		(0.0'-1.0') CONCRETE.			
1.0					0.0		(1.0'-2.6') SAND, fine to medium; little very coarse sand to small pebbles, round to subround; dry; dark yellow brown (10YR 4/6). Note: FILL.			
2.6					0.0		(2.6'-5.5') CLAY, medium plasticity, no dilatancy; little fine sand; trace granules to small pebbles; dry; very stiff; dark yellow brown (10YR 4/4).			
5.5					0.0		(5.5'-6.5') CLAY, medium plasticity, no dilatancy; and SAND, fine to medium; little very coarse sand to granules; trace small pebbles, round; dry; very stiff; dark yellow brown (10YR 4/4).			
6.5					0.0		(6.5'-12.0') CLAY, high plasticity; trace very fine sand; moist; medium stiff; very dark gray (10YR 3/1).			
12.0		2	7.0-17.0	10.0	0.0		(12.0'-15.5') CLAY, high plasticity slow dilatancy; and SILT; non-plastic, slow dilatancy; wet; very soft; dark gray (10YR 4/1).			
15.5					0.0		(15.5'-17.0') SAND, very fine to fine; trace medium to coarse sand; and SILT, non-plastic, slow dilatancy; wet; dark gray (10YR 4/1).			

 Infrastructure · Water · Environment · Buildings	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 12.0'-27.0', 29.0'-31.0', at 59.0', and from 52.0'-63.5' bgs. No odor or staining observed.
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<b>Date Start:</b> 9/5/2014 <b>Date Finish:</b> 9/8/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Eastings:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 82.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> J.Ness	<b>Well/Boring ID:</b> PW-14-02  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Sunny 85 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20	3	17.0-27.0	10.0	0.0		(17.0'-19.0') SAND, very fine; trace medium to coarse sand, round; little silt; wet; poorly sorted; dark gray (10YR 4/1).			
					0.0		(19.0'-27.0') SAND, medium to coarse, round; little fine sand; trace granules to small pebbles, round to subround; poorly sorted; wet; dark gray (10YR 4/1).			
					0.0		(27.0'-29.0') CLAY, high plasticity, no dilatancy; little fine to medium sand; little granules to medium pebbles, round to subround; stiff; gray (10YR 5/1). Note: Glacial Till.			
30	-30	4	27.0-37.0	10.0	0.0		(29.0'-31.0') SAND, fine to medium; little coarse sand; little clay; poorly sorted; wet; gray (10YR 5/1).			
					0.0		(31.0'-32.5') CLAY, high plasticity, no dilatancy; little fine to medium sand; little granules to medium pebbles, round to subround; stiff; gray (10YR 5/1). Note: Glacial Till.			
					0.0		(32.5'-35.0') SAND, fine to medium; little coarse sand; little clay; poorly sorted; wet; gray (10YR 5/1).			
35	-35				0.0		(35.0'-41.0') CLAY, high plasticity, no dilatancy; little fine to medium sand; little granules to medium pebbles, round to subround; stiff; gray (10YR 5/1). Note: Glacial Till.			


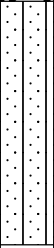


0.0-67.0' bgs.  
(Bentonite Grout)


3.0' ags - 75.0' bgs. (6" Well Riser)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0'-27.0', 29.0'-31.0', at 59.0', and from 52.0'-63.5' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 9/5/2014 <b>Date Finish:</b> 9/8/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Eastings:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 82.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> J.Ness	<b>Well/Boring ID:</b> PW-14-02  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Sunny 85 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
40	-40	5	37.0-47.0	10.0						
								(41.0'-45.0') SAND, very fine; and SILT, non-plastic, rapid dilatancy; well sorted; dry; grayish brown (10YR 5/2).		
45	-45							(45.0'-62.0') SAND, very fine; trace silt; well sorted; dry; grayish brown (10YR 5/2).		
50	-50	6	47.0-57.0	10.0				Note: Moist and little granules to small pebbles, round to subround at 49.5' bgs.		
55	-55							Note: Dry and no granules to small pebbles at 56.0' bgs.		

 Infrastructure · Water · Environment · Buildings	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 12.0'-27.0', 29.0'-31.0', at 59.0', and from 52.0'-63.5' bgs. No odor or staining observed.
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**Date Start:** 9/5/2014  
**Date Finish:** 9/8/2014  
**Drilling Company:** Cascade  
**Driller's Name:**  
**Drilling Method:** Continuous  
**Sampling Method:** 10', 5" core barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Eastings:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 82.0' bgs.  
**Surface Elevation:**  
**Descriptions By:** J.Ness

**Well/Boring ID:** PW-14-02  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Sunny 85 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
60	-60	7	57.0-67.0	5.11				Note: Wet at 59.0' bgs.		
								(62.0'-63.5') SAND, very fine; and SILT, non-plastic, rapid dilatancy; well sorted; wet; grayish brown (10YR 5/2).		
65	-65							(63.5'-68.0') CLAY, high plasticity, no dilatancy; little medium sand; little granules to medium pebbles, round to subround; moist; black (10YR 2/1).		
70	-70	8	67.0-77.0					(68.0'-71.0') CLAY, high plasticity, no dilatancy; little granules to medium pebbles; trace small cobbles; dry; hard; gray (10YR 4/1).		67.0-69.0' bgs. (Bentonite)
								(71.0'-76.0') SANDSTONE, weathered. Note: interbedded shale.		69.0-71.0' bgs. (Choaker Sand - K&E #00)
75	-75							(76.0'-82.0') SANDSTONE, weathered.		71.0-82.0' bgs. (Filter Pack - K&E #1)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0'-27.0', 29.0'-31.0', at 59.0', and from 52.0'-63.5' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 9/5/2014 <b>Date Finish:</b> 9/8/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 82.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> J.Ness	<b>Well/Boring ID:</b> PW-14-02  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Sunny 85 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
80	-80	9	77.0-82.0		0.0 0.0 0.0 0.0 0.0					<p>75.0-80.0' bgs. (6.0' 10-Slot Stainless Steel Screen).</p>
85	-85							End of boring at 82.0' bgs.		
90	-90									
95	-95									

	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 12.0'-27.0', 29.0'-31.0', at 59.0', and from 52.0'-63.5' bgs. No odor or staining observed.
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**Date Start:** 10/8/2014  
**Date Finish:** 10/9/2014  
**Drilling Company:** Cascade  
**Driller's Name:**  
**Drilling Method:** Continuous  
**Sampling Method:** 10', 5" core barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 92.0' bgs.  
**Surface Elevation:**  
**Descriptions By:** A.Richmond

**Well/Boring ID:** PW-14-03R  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Sunny 55 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
		1	0.0-10.0	10.0	NA		(0.0'-1.0') CONCRETE.			
					NA		(1.0'-10.0') CLAY, little sand, low plasticity, slow dilatancy; little medium pebbles, subround to subangular; moist; stiff; dark grayish brown (10YR 4/2). NOTE: Fill.			
5	-5				NA					
		2	10.0-20.0	10.0	NA		(10.0'-20.0') CLAY, little sand, high plasticity, no dilatancy; trace small pebbles, subround to subangular; dry; medium stiff; dark gray (10YR 4/1). NOTE: Till.			
10	-10				NA					

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 20.0'-25.5', 34.0'-37.0', at 56.0', from 59.0'-83.0' bgs.  
 No odor or staining observed.



**Date Start:** 10/8/2014  
**Date Finish:** 10/9/2014  
**Drilling Company:** Cascade  
**Driller's Name:**  
**Drilling Method:** Continuous  
**Sampling Method:** 10', 5" core barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Eastings:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 92.0' bgs.  
**Surface Elevation:**  
**Descriptions By:** A.Richmond

**Well/Boring ID:** PW-14-03R  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Sunny 55 F


DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
15	-15				NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
20	-20				NA					
		3	20.0-30.0	10.0	NA			(20.0'-25.5') SAND, medium; little silt; trace granules, subround to subangular; well sorted; wet; dark gray (10YR 4/1).		
					NA					
					NA					
					NA					
					NA					
					NA					
25	-25				NA					
					NA			(25.5'-34.0') CLAY, little silt, low plasticity, slow dilatancy; little sand; little medium to large pebbles, subangular; dry; stiff; dark gray 910YR 4/1). NOTE: Till.		
					NA					
					NA					
					NA					

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 20.0'-25.5', 34.0'-37.0', at 56.0', from 59.0'-83.0' bgs.  
 No odor or staining observed.




<b>Date Start:</b> 10/8/2014 <b>Date Finish:</b> 10/9/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 92.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Richmond	<b>Well/Boring ID:</b> PW-14-03R  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3  <b>Weather Conditions:</b> Sunny 55 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction		
30	-30	4	30.0-40.0	10.0	NA							
					NA							
					NA							
					NA							
					NA							
					NA							
35	-35				NA			(34.0'-36.0') SAND, very fine; and SILT, non-plastic; trace small pebbles; wet; dark gray brown (10YR 4/2).				
					NA							
					NA	☒ ☒		(36.0'-37.0') GRANULES, subangular; little coarse sand; poorly sorted; wet; dark grayish brown (10YR 4/2).				
					NA	☒ ☒		(37.0'-40.0') SAND, very coarse; some medium pebbles, subround to subangular; poorly sorted; moist; dark olive brown (2.5Y 3/3).				
					NA							
					NA							
40	-40	5	40.0-50.0	10.0	NA			(40.0'-42.0') SAND, fine; some silt; poorly sorted; moist; olive brown (2.5Y 4/4).		0.0-81.0' bgs. (Bentonite Grout)		
					NA							
					NA					(42.0'-45.0') SAND, very fine; little silt; poorly sorted; dry; pale brown (2.5Y 3/3).		
					NA							

	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 20.0'-25.5', 34.0'-37.0', at 56.0', from 59.0'-83.0' bgs. No odor or staining observed.
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<b>Date Start:</b> 10/8/2014 <b>Date Finish:</b> 10/9/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Eastings:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 92.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Richmond	<b>Well/Boring ID:</b> PW-14-03R  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3  <b>Weather Conditions:</b> Sunny 55 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
45.0					NA			(45.0'-51.0') CLAY, little sand, little silt, low plasticity, low dilatancy; dry; very stiff; dark gray (2.5Y 4/1). NOTE: Till.		
50.0					NA					
55.0					NA					
60.0					NA					
65.0					NA					
51.0	-50	6	50.0-60.0	10.0	NA			(51.0'-59.0') SAND, little silt, medium; trace granules, subround to subangular; poorly sorted dark gray (10YR 4/1).  NOTE: Wet at 56.0' bgs.		
56.0					NA					
61.0					NA					
66.0					NA					
71.0					NA					
59.0					NA			(59.0'-66.0') SAND, medium; well sorted; wet; dark gray (10YR 4/1).		
60.0	-60				NA					

	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 20.0'-25.5', 34.0'-37.0', at 56.0', from 59.0'-83.0' bgs. No odor or staining observed.
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<b>Date Start:</b> 10/8/2014 <b>Date Finish:</b> 10/9/2014 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> <b>Drilling Method:</b> Continuous <b>Sampling Method:</b> 10', 5" core barrel <b>Rig Type:</b> Sonic <b>Water Level Start (ft. bgs.):</b> NA <b>Water Level Finish (ft. btoc.):</b> NA	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 92.0' bgs. <b>Surface Elevation:</b>  <b>Descriptions By:</b> A.Richmond	<b>Well/Boring ID:</b> PW-14-03R  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 3  <b>Weather Conditions:</b> Sunny 55 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
65	-65	7	60.0-70.0	10.0	NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
70	-70	8	70.0-80.0	10.0	NA			(66.0'-73.0') SAND, little silt, little clay, medium; little medium pebbles, subround to subangular; poorly sorted; wet; dark gray (2.5Y 4/1).		
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
75	-75				NA			(73.0'-83.0') SILT, some sand, non-plastic, rapid dilatancy; wet; stiff; dark brown (10YR 3/3).		

 <p>ARCADIS Infrastructure · Water · Environment · Buildings</p>	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 20.0'-25.5', 34.0'-37.0', at 56.0', from 59.0'-83.0' bgs. No odor or staining observed.
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**Date Start:** 10/8/2014  
**Date Finish:** 10/9/2014  
**Drilling Company:** Cascade  
**Driller's Name:**  
**Drilling Method:** Continuous  
**Sampling Method:** 10', 5" core barrel  
**Rig Type:** Sonic  
**Water Level Start (ft. bgs.):** NA  
**Water Level Finish (ft. btoc.):** NA

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 92.0' bgs.  
**Surface Elevation:**  
**Descriptions By:** A.Richmond

**Well/Boring ID:** PW-14-03R  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Sunny 55 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
80	-80	9	80.0-90.0	10.0	NA			(83.0'-92.0') BEDROCK, weathered. NOTE: Grand River Formation.		<p>81.0-83.0' bgs. (Bentonite)</p> <p>85.0-90.0' bgs. (6.0" 10-Slot Stainless Steel Screen).</p> <p>83.0-92.0' bgs. (Choker Sand - K&amp;E #1)</p>
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
					NA					
90	-90	10	90.0-92.0	2.0	NA					
					NA					
End of boring at 92.0' bgs.										

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 20.0'-25.5', 34.0'-37.0', at 56.0', from 59.0'-83.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.18.14  
**Date Finish:** 8.18.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 6.0', 17.0', 66.0'  
**Water Level Finish (ft. btoc.):** 10.0', 23.0', 73.0'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-01  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:**

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									Steel stick up casing (3.0-0.0' above ground surface)
0.0-1.0'					NA		(0.0-1.0') CONCRETE.			
1.0-2.0'					0.8		(1.0-2.0') SAND, coarse, subround to subangular; some medium pebbles, angular; trace silt; poorly sorted; moist; light olive brown (2.5Y 5/6).			
2.0-6.0'					NA		(2.0-6.0') CONCRETE.			
6.0-10.0'		1	0.0-7.0	5.7	NA		(6.0-10.0') SAND, medium; some small pebbles, subround; and SILT; wet; light olive brown (2.5Y 5/6).			
10.0-17.0'		2	7.0-17.0	10.0	0.0		(10.0-17.0') CLAY, high plasticity, slow dilatancy; little sand; little small pebbles, subround to subangular; dry; medium stiff; dark gray (10YR 4/1). NOTE: TILL.			2" PVC well casing (-3.0-70.0' bgs) Bentonite Grout (0.0-66.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 6.0-10.0' bgs and from 17.0'-23.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.18.14  
**Date Finish:** 8.18.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 6.0', 17.0', 66.0'  
**Water Level Finish (ft. btoc.):** 10.0', 23.0', 73.0'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-01  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:**

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction	
20	-20	3	17.0 27.0	10.0	0.0		(17.0-23.0') SAND, medium; trace silt; well sorted; wet; dark grayish brown (2.5Y 4/2).			2" PVC well casing (-3.0-70.0' bgs) Bentonite Grout (0.0-66.0' bgs)	
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
25	-25				0.0		(23.0-30.0') CLAY, medium plasticity, slow dilatancy; little small pebbles, subround to subangular; dry; medium stiff; dark gray (10YR 4/1). NOTE: TILL.				
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
30	-30	4	27.0-37.0	7.75	0.0		(30.0-41.0') SAND, medium; trace small pebbles, subround; little silt; well sorted; dry; gray (2.5Y 5/1).				
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
35	-35				0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						
					0.0						

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 6.0-10.0' bgs and from 17.0'-23.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.18.14  
**Date Finish:** 8.18.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 6.0', 17.0', 66.0'  
**Water Level Finish (ft. btoc.):** 10.0', 23.0', 73.0'

**Northing:**  
**Eastings:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-01  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:**

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
40	-40	5	37.0-47.0	10.0	0.0			(41.0-46.0') SAND, medium; little medium pebbles, subangular to subround; and SILT, low plasticity, rapid dilatancy; dry; dark gray (10 YR 4/1).		
45	-45							(46.0-47.0') SAND, fine; little silt; poorly sorted; dry; light brownish gray (2.5Y 6/2).		
50	-50							(47.0-63.0') SILT, low plasticity, rapid dilatancy; some sand; little medium pebbles, angular; dry; hard; dark gray (2.5Y 4/1).		
55	-55	6	47.0-57.0	8.75	0.0					

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 6.0-10.0' bgs and from 17.0'-23.0' bgs.  
 No odor or staining observed.

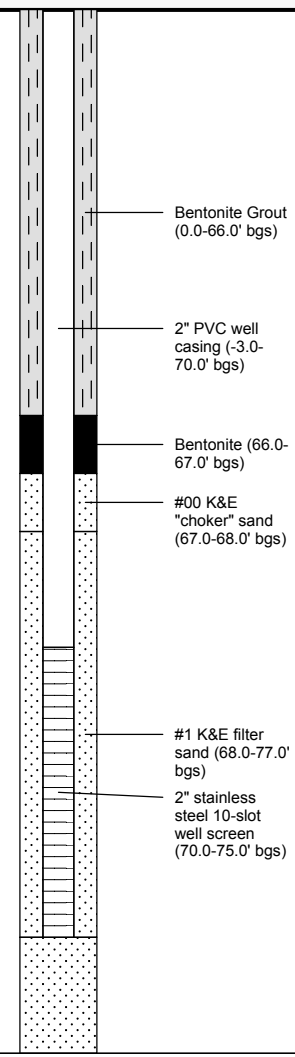


**Date Start:** 8.18.14  
**Date Finish:** 8.18.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 6.0', 17.0', 66.0'  
**Water Level Finish (ft. btoc.):** 10.0', 23.0', 73.0'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-01  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:**

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
60	-60	7	57.0-65.0	8.0	0.0			NOTE: transition to very hard at 60' bgs.		
65	-65	8	65.0-67.0	2.0	0.1			(63.0-77.0') BEDROCK. NOTE: Weathered sandstone with interbedded shales. Saginaw Formation.		
70	-70	9	67.0-72.0	6.0	0.1					
75	-75	10	72.0-77.0	5.0	0.0					
					0.0					
								End of boring at 77' bgs.		




**Remarks:** bgs = below ground surface  
 Groundwater encountered from 6.0-10.0' bgs and from 17.0'-23.0' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 8.19.14 <b>Date Finish:</b> 8.20.14 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Scott/Ralph/Jose <b>Drilling Method:</b> Rotosonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Rotosonic <b>Water Level Start (ft. bgs.):</b> 7', 12', 26', 38', 63' <b>Water Level Finish (ft. btoc.):</b> 8', 20', 30', 43', 72'	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 72.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> Adam Richmond	<b>Well/Boring ID:</b> TW-14-02  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> T. Storms 80 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									Steel stick up casing (3.0-0.0' above ground surface)
0.0		1	0.0-7.0	5.0	NA		(0.0-3.0') CONCRETE.			
3.0					NA		(3.0-5.0') NO RECOVERY (SAND).			
5.0					NA		(5.0-7.0') CONCRETE.			
7.0					0.1		(7.0-8.0') SAND, coarse, subround to subangular; some medium pebbles, subround to subangular; little silt; wet; yellowish brown (10YR 5/6).			
8.0					0.0		(8.0-10.0') LEAVES, ROOTS, ORGANIC MATERIAL.			2" PVC well casing (0.0-67.0' bgs) Bentonite Grout (0.0-63.0' bgs)
10.0					0.0		(10.0-12.0') SILT, medium plasticity, no dilatancy; some sand; little small pebbles, subround to subangular; moist; very soft; olive brown (2.5Y 4/4).			
12.0		2	7.0-17.0	NA	0.1		(12.0-17.0') CLAY, medium plasticity, no dilatancy; wet; very soft; gray (10YR 5/1).			
15.0					0.0					
17.0					0.1					

 <p>ARCADIS Infrastructure · Water · Environment · Buildings</p>	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 7.0-8.0' bgs, 12.0-20.0', 26.0-30.0', 38.0-43.0, and at 63.0' bgs. No odor or staining observed.
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**Date Start:** 8.19.14  
**Date Finish:** 8.20.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 7', 12', 26', 38', 63'  
**Water Level Finish (ft. btoc.):** 8', 20', 30', 43', 72'

**Northing:**  
**Eastings:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 72.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond


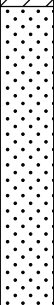

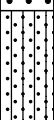
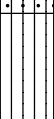
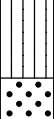
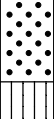
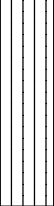
**Well/Boring ID:** TW-14-02  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** T. Storms 80 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction	
20	-20	3	17.0 27.0	10.0	0.1			(17.0-20.0') SAND, coarse, subangular to subround; little small pebbles, subround to subangular; and SILT, little clay; wet; gray (10YR 5/1).		2" PVC well casing (0.0-67.0' bgs) Bentonite Grout (0.0-63.0' bgs)	
	0.0										
	0.0										
	0.0										
25	-25				0.1			(20.0-26.0') CLAY, medium plasticity, slow dilatancy; little sand; little medium pebbles, subround to subangular; dry; stiff; very dark grayish brown (10YR 3/2). NOTE: TILL.			
					0.0						
					0.0						
					0.0						
					0.0						
30	-30	4	27.0- 37.0	10.0	0.0			(26.0-30.0') SAND, medium; well sorted; wet; grayish brown (10YR 5/2).			
	0.0										
	0.0										
	0.0										
					0.0			(30.0-35.0') CLAY, medium plasticity, slow dilatancy, little sand; little medium pebbles, subround to subangular; dry; stiff; very dark grayish brown (10YR 3/2). NOTE: TILL.			
					0.0						
					0.1						
					0.1						
35	-35				0.1			(35.0-38.0') CLAY, low plasticity, no dilatancy; some sand; trace small pebbles, subround to subangular; moist; medium stiff; very dark grayish brown (10YR 3/2).			


**Remarks:** bgs = below ground surface  
 Groundwater encountered from 7.0-8.0' bgs, 12.0-20.0', 26.0-30.0', 38.0-43.0, and at 63.0' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 8.19.14 <b>Date Finish:</b> 8.20.14 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Scott/Ralph/Jose <b>Drilling Method:</b> Rotosonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Rotosonic <b>Water Level Start (ft. bgs.):</b> 7', 12', 26', 38', 63' <b>Water Level Finish (ft. btoc.):</b> 8', 20', 30', 43', 72'	<b>Northing:</b> <b>Eastings:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 72.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> Adam Richmond	<b>Well/Boring ID:</b> TW-14-02 <b>Client:</b> RACER <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> T. Storms 80 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
					0.0					
40	-40	5	37.0-47.0	10.0				(38.0-43.0') SAND, medium; little granules, subround to subangular; little silt; well sorted; wet; dark grayish brown (10YR 4/2).		
					0.0			(43.0-45.0') SAND, fine; little small pebbles, subangular; some clay; poorly sorted; dry; dark gray (10YR 4/1).		
45	-45				0.0			(45.0-47.0') SAND, fine; well sorted; dry; very dark gray (10YR 3/1).		
					0.1			(47.0-50.0') SILT, non plastic, no dilatancy; little medium pebbles, subround to subangular; dry; stiff; dark gray (10YR 4/1).		
50	-50				0.0			(50.0-52.0') SAND, medium; some medium pebbles, subangular to subround; poorly sorted; dry; gray (10YR 6/1).		
		6	47.0-57.0	NA	0.0			(52.0-63.0') SILT, non plastic, slow dilatancy; little sand; little granules, subangular; dry; hard; very dark gray (10YR 3/1).		
55	-55				0.0					

2" PVC well casing (0.0-67.0' bgs)  
Bentonite Grout (0.0-63.0' bgs)

 <p>ARCADIS  Infrastructure · Water · Environment · Buildings</p>	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 7.0-8.0' bgs, 12.0-20.0', 26.0-30.0', 38.0-43.0, and at 63.0' bgs. No odor or staining observed.
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**Date Start:** 8.20.14  
**Date Finish:** 8.20.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 12', 26', 57', 68'  
**Water Level Finish (ft. btoc.):** 20', 27', 64.5', 80'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 82.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-03  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Cloudy 75 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
0.0-1.5'					NA		(0.0-1.5') CONCRETE			Steel stick up casing (3.0-0.0' above ground surface)
1.5-3.5'					0.2	X	(1.5-3.5') CLAY, low plasticity, rapid dilatancy, some sand, little medium pebbles, subround; moist, stiff, very dark grayish brown (2.5Y 3/2). NOTE: FILL.			
3.5-4.0'					0.2	X	(3.5-4.0') PEBBLE, medium, angular, little sand, coarse, angular, poorly sorted; moist, black (2.5Y 2.5/1). NOTE: FILL.			
4.0-7.0'		1	0.0-7.0	6.7	0.3	X	(4.0-7.0) CLAY, medium plasticity, slow dilatancy, little sand, little medium pebbles, subangular; dry, medium stiff; very dark grayish brown (2.5Y 3/2). NOTE: FILL.			
	-5				0.3	X				
					0.1	X				
					0.2	X				
					0.0		(7.0-12.0') CLAY, high plasticity, no dilatancy; dry, stiff; greenish gray (GLEY1 5/1).			2" PVC well casing (0.0-75.0' bgs)
	-10				0.0					Bentonite Grout (0.0-71.0' bgs)
		2	7.0-17.0	9.0	0.0		(12.0-17.0') SAND, medium, and CLAY, low plasticity, rapid dilatancy; wet; dark gray (10YR 4/1).			
					0.0					
					0.0					
	-15				0.0					
					0.0					
					0.0					
					0.1	X	(17.0-20.0') PEBBLE, small, subangular to subround, little sand, medium, trace silt, poorly sorted; wet; dark gray (10YR 4/1).			

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0-20.0', 26.0-27.0', 57.0-64.5' and 68.0-80.0' bgs.  
 No odor or staining observed.





**Date Start:** 8.20.14  
**Date Finish:** 8.20.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 12', 26', 57', 68'  
**Water Level Finish (ft. btoc.):** 20', 27', 64.5', 80'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 82.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-03  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Cloudy 75 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
45	-45	5	37.0-47.0	8.5	0.0					
					0.0			(44.0-47.0) SAND, fine, some silt, poorly sorted; moist; grayish brown (2.5Y 5/2).		
					0.0			(47.0-49.5') SAND, medium, some silt, little medium pebbles, angular, poorly sorted; moist; olive brown (2.5Y 4/3).		
50	-50	6	47.0-57.0	10.0	0.0			(49.5-57.0') SAND, fine to medium, trace medium pebbles, subangular, well sorted; dry; gray (2.5Y 6/1).		
					0.0			(57.0-60.0') SAND, medium, little silt, well sorted; wet, dark grayish brown (2.5Y 4/2).		
60	-60				0.0			(60.0-64.5') SAND, fine, and SILT, non plastic, rapid dilatancy, trace granules, subangular to subround; wet; dark grayish brown (2.5Y 4/2).		

2" PVC well casing (0.0-75.0' bgs)  
 Bentonite Grout (0.0-71.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0-20.0', 26.0-27.0', 57.0-64.5' and 68.0-80.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.20.14  
**Date Finish:** 8.20.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 12', 26', 57', 68'  
**Water Level Finish (ft. btoc.):** 20', 27', 64.5', 80'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 82.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-03  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
**Weather Conditions:** Cloudy 75 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
65	-65	7	57.0-67.0	10.0	0.0			(64.5-66.0') CLAY, medium plasticity, slow dilatancy, little small pebbles, subangular to subround, trace sand; dry, soft; very dark brown (10YR 2/2).		
					0.0			(66.0-68.0') CLAY, non plastic, no dilatancy, some sand, little medium pebbles, subangular; dry, stiff; very dark gray (10YR 3/1). NOTE: TILL.		Bentonite Grout (0.0-71.0' bgs)
					0.0			(68.0-69.0') SAND, coarse, angular, some medium pebbles, subangular, poorly sorted; wet, grayish brown (10YR 5/2).		2" PVC well casing (0.0-75.0' bgs)
70	-70				0.0			(69.0-76.0') SAND, fine, and PEBBLES, medium, angular, little clay; wet; very dark gray (10YR 3/1).		Bentonite (71.0-72.0' bgs)
		8	67.0-77.0	10.0	0.0			(76.0-82.0') SANDSTONE, medium grained; wet, gray (5Y 6/1). NOTE: interbedded shales, Saginaw formation.		#00 K&E "choker" sand (72.0-73.0' bgs)
75	-75				0.0					#1 K&E filter sand (73.0-82.0' bgs)
		9	77.0-82.0	5.0	0.0			NOTE: Dry shale at 80.0-82.0' bgs.		2" stainless steel 0.1 slot well screen (75.0-80.0' bgs)
80	-80				0.0			End of boring at 82' bgs.		

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 12.0-20.0', 26.0-27.0', 57.0-64.5' and 68.0-80.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.20.14  
**Date Finish:** 8.20.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 4', 17', 32', 67'  
**Water Level Finish (ft. btoc.):** 5', 22', 36', 70'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 82.0  
**Surface Elevation:**  
  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-04  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
  
**Weather Conditions:** Partly Cloudy 80 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									Steel stick up casing (3.0-0.0' above ground surface)
0.1						↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	(0.0-1.0') TOPSOIL			
0.3						X	(1.0-4.0') CLAY, medium plasticity, slow dilatancy, little sand, little medium pebbles, subangular to subround; moist, soft; greenish gray (GLEY 1 5/1). NOTE: Fill.			
0.2						X				
0.1						X				
0.3		1	0.0-7.0	6.5		X	(4.0-5.0') PEBBLES, small, subround to subangular, little medium sand, trace silt, poorly sorted; wet; light olive brown (2.5Y 5/4). NOTE: Fill.			
0.4						X	(5.0-6.0') SAND, fine, and CLAY, low plasticity, no dilatancy, little medium pebbles, subangular; moist, very dark grayish brown (2.5Y 5/2). NOTE: Fill.			
0.3						•••••	(6.0-7.0') SAND, medium, trace silt, well sorted; moist; light olive brown (2.5Y 5/6).			
0.0							(7.0-17.0') CLAY, high plasticity, no dilatancy; moist, stiff; dark gray (10YR 4/1). NOTE: Transition to very soft at 12.0' bgs.			2" PVC well casing (0.0-72.0' bgs) Bentonite Grout (0.0-68.0' bgs)
0.0		2	7.0-17.0	10.0						
0.0						•••••	(17.0-22.0) SAND, medium, some clay, poorly sorted; wet; dark garyish brown (2.5Y 4/2).			

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 4.0-5.0', 17.0-22.0', 32.0-36.0' and 67.0-70.0' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 8.20.14 <b>Date Finish:</b> 8.20.14 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Scott/Ralph/Jose <b>Drilling Method:</b> Rotosonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Rotosonic <b>Water Level Start (ft. bgs.):</b> 4', 17', 32', 67' <b>Water Level Finish (ft. btoc.):</b> 5', 22', 36', 70'	<b>Northing:</b> <b>Eastings:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 82.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> Adam Richmond	<b>Well/Boring ID:</b> TW-14-04  <b>Client:</b> RACER  <b>Location:</b> RACER Lansing Plant 2  <b>Weather Conditions:</b> Partly Cloudy 80 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20	3	17.0 27.0	10.0	0.0			(22.0-32.0') CLAY, medium plasticity, slow dilatancy, little sand, little medium pebbles, subround to subangular; dry, stiff; olive brown (2.5Y 4/4). NOTE: TILL.		
	0.0									
	0.0									
25	-25	4	27.0- 37.0	9.0	0.0			(32.0-36.0') SAND, coarse to very coarse, subround to subangular, some silt, little granules, subangular to subround, poorly sorted; wet; olive brown (2.5Y 4/4).		
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
30	-30				0.0			(36.0-44.0') CLAY, medium plasticity, slow dilatancy, little sand, little medium pebbles, subround to subangular; dry, stiff; olive brown (2.5Y 4/4). NOTE: TILL ~1"; wet sand seam at 36.5' bgs.		2" PVC well casing (0.0-72.0' bgs) Bentonite Grout (0.0-68.0' bgs)
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 4.0-5.0', 17.0-22.0', 32.0-36.0' and 67.0-70.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.20.14  
**Date Finish:** 8.20.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 4', 17', 32', 67'  
**Water Level Finish (ft. btoc.):** 5', 22', 36', 70'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 82.0  
**Surface Elevation:**  
  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-04  
**Client:** RACER  
**Location:** RACER Lansing Plant 2  
  
**Weather Conditions:** Partly Cloudy 80 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
45	-45	5	37.0-47.0	10.0	0.0			(44.0-57.0) SAND, fine, some silt, poorly sorted; dry; grayish brown (2.5Y 5/2).		
50	-50	6	47.0-57.0	6.0	0.0			(57.0-61.0') SAND, fine to medium, some silt, trace medium pebbles, subangular poorly sorted; moist; dark grayish brown (2.5Y 4/2).		2" PVC well casing (0.0-72.0' bgs) Bentonite Grout (0.0-68.0' bgs)
60	-60				0.0			(61.0-66.0') SAND, medium, well sorted; moist; grayish brown (2.5Y 5/2).		

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 4.0-5.0', 17.0-22.0', 32.0-36.0' and 67.0-70.0' bgs.  
 No odor or staining observed.





**Date Start:** 8.21.14  
**Date Finish:** 8.21.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 7', 28', 57' 67'  
**Water Level Finish (ft. btoc.):** 21', 35', 63', 75'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**  
  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-05  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
  
**Weather Conditions:** Sunny 85 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
		1	0.0-7.0	5.0	NA		(0.0-3.0') CONCRETE			Steel stick up casing (3.0-0.0' above ground surface)
					NA		(3.0-5.0') NO RECOVERY			
					NA		(5.0-7.0') CONCRETE			
					0.0		(7.0-14.0') CLAY, high plasticity, slow dilatancy, trace sand; wet, very soft; olive brown (2.5Y 4/3).			2" PVC well casing (0.0-72.0' bgs) Bentonite Grout (0.0-68.0' bgs)
		2	7.0-17.0	8.0	0.0		NOTE: Wet 1" sand seam at 13' bgs.			
					0.0		(14.0-17.0') SAND, medium, and CLAY, medium plasticity, slow dilatancy; wet; dark gray (2.5Y 4/1).			
					0.0		(17.0-21.0') SAND, very coarse, some clay, little small pebbles, subangular, poorly sorted; wet; very dark gray (2.5Y 3/1).			

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 7.0-21.0', 28.0-35.0' and 67.0-75.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.21.14  
**Date Finish:** 8.21.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 7', 28', 57' 67'  
**Water Level Finish (ft. btoc.):** 21', 35', 63', 75'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-05  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Sunny 85 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction		
20	-20	3	17.0 27.0	10.0	0.0							
										(21.0-28.0') CLAY, medium plasticity, no dilatancy, little sand, little medium pebbles, subround to subangular; dry, stiff; dark grayish brown (2.5Y 4/2). NOTE: TILL.		
25	-25	4	27.0- 37.0	9.0	0.0							
										(28.0-32.0') SAND, medium, some silt, little small pebbles, subround to subangular, poorly sorted; wet; dark grayish brown (2.5Y 4/2).		
30	-30				0.0							
										(32.0-35.0') SAND, medium, and SILT, little clay, little medium pebbles, subround to subangular; wet; dark gray (10YR 4/1).		
35	-35				0.0							
										(35.0-45.0') CLAY, medium plasticity, no dilatancy, little sand, little medium pebbles, subround to subangular; dry, stiff; dark grayish brown (2.5Y 4/2). NOTE: TILL.		

2" PVC well casing (0.0-72.0' bgs)  
 Bentonite Grout (0.0-68.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 7.0-21.0', 28.0-35.0' and 67.0-75.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.21.14  
**Date Finish:** 8.21.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 7', 28', 57' 67'  
**Water Level Finish (ft. btoc.):** 21', 35', 63', 75'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-05  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Sunny 85 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0.0		5	37.0-47.0	NA	0.0					
45.0	-45				0.0			(45.0-55.0') SAND, fine to medium, some silt, poorly sorted; dry, gray (2.5Y 6/1).		
50.0	-50	6	47.0-57.0	8.33	0.0					
55.0	-55				0.0			(55.0-57.0') SAND, fine to medium, well sorted; dry, gray (10YR 6/1).		
60.0	-60				0.0			(57.0-63.0') SAND, medium, little small pebbles, subround, trace silt, well sorted; wet, olive brown (2.5Y 4/4).		

2" PVC well casing (0.0-72.0' bgs)  
 Bentonite Grout (0.0-68.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 7.0-21.0', 28.0-35.0' and 67.0-75.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.21.14  
**Date Finish:** 8.21.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 7', 28', 57' 67'  
**Water Level Finish (ft. btoc.):** 21', 35', 63', 75'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA

**Borehole Depth (ft. bgs.):** 77.0  
**Surface Elevation:**

**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-05

**Client:** RACER

**Location:** RACER Lansing Plant 3

**Weather Conditions:** Sunny 85 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
65	-65	7	57.0-67.0	NA	0.1			(63.0-67.0') CLAY, medium plasticity, slow dilatancy, little sand, little medium pebbles, angular, trace large pebbles, angular; moist, medium stiff; very dark gray (GLEY 1 3/1).		Bentonite Grout (0.0-68.0' bgs) 2" PVC well casing (0.0-72.0' bgs)
70	-70				0.0			(67.0-75') SANDSTONE, medium grained, and SILT, low plasticity, no dilatancy; wet; dark gray (2.5Y 4/1).		Bentonite (68.0-69.0' bgs) #00 K&E "choker" sand (69.0-70.0' bgs)
75	-75	8	67.0-77.0	10.0	0.0			(75.0-77.0') SILT, medium plasticity, slow dilatancy, little sand, little granules, subangular; wet, very soft; very dark grayish brown (10YR 3/2)		#1 K&E filter sand (70.0-77.0' bgs) 2" stainless steel 0.1 slot well screen (72.0-77.0' bgs)
80	-80							End of boring at 77' bgs.		

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 7.0-21.0', 28.0-35.0' and 67.0-75.0' bgs.  
 No odor or staining observed.





**Date Start:** 8.22.14  
**Date Finish:** 8.22.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 19', 72'  
**Water Level Finish (ft. btoc.):** 24', 87'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 87.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-06  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Cloudy 84 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20	3	17.0 27.0	10.0	0.0		(19.0-21') SAND, fine to medium, some silt, little small pebbles, subangular; wet, poorly sorted; yellowish brown (10YR 5/8).			
	0.1					(21.0-22.0') SILT, non plastic, and SAND, fine; wet, light olive brown (2.5Y 5/4).				
	0.2					(22.0-23.0') SAND, medium, little silt, well sorted; wet; light olive brown (2.5Y 5/4).				
	0.1					(23.0-23.5') SILT, non plastic, rapid dilatancy, some sand; wet, very stiff; grayish brown (2.5Y 5/2).				
	0.0					(23.5-24.0') SAND, coarse, subround to subangular, little medium pebbles, subangular, trace silt, poorly sorted; wet; olive brown (2.5Y 4/6).				
25	-25	4	27.0- 37.0	10.0	0.0		(24.0-33.0') CLAY, medium plasticity, slow dilatancy, little sand, little medium pebbles, subround to subangular; dry, stiff; dark gray (2.5Y 4/1). NOTE: TILL.			
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
	0.0									
30	-30				0.0		(33.0-35.0') SAND, medium, little silt, little medium pebbles, subround to subangular, poorly sorted; dry; light yellowish brown (2.5Y 6/4).			
					0.7					
					0.3		(35.0-37.0') SAND, fine, little silt, little medium pebbles, angular, trace large pebbles, angular, poorly sorted; dry; white (2.5Y 8/1).			
					0.2					
					0.0		(37.0-40.0') SAND, medium, little medium pebbles, subround to subangular, trace silt, poorly sorted; dry; light yellowish brown (2.5Y 6/3).			
					1.0					
					0.7					
40	-40				0.2		(40.0-46.0') PEBBLES, medium, subround to subangular, some medium sand, little small pebbles, subround to subangular, poorly sorted; dry; light gray (2.5Y 7/2).			
					0.4					

2" PVC well casing (0.0-82.0' bgs)  
 Bentonite Grout (0.0-78.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 19.0-24.0' and 72.0-87.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.22.14  
**Date Finish:** 8.22.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 19', 72'  
**Water Level Finish (ft. btoc.):** 24', 87'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 87.0  
**Surface Elevation:**  
**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-06  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Cloudy 84 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
45	-45	5	37.0-47.0	10.0	0.2					
					0.1					
					0.1					
					0.0					
					0.3			(46.0-48.0') SAND, fine, little silt, little small pebbles, subangular, poorly sorted; dry; white (2.5Y 8/1).		
					0.2			(48.0-49.0') SAND, fine to medium, little granules, subangular to subround, poorly sorted; dry; pale brown (2.5Y 8/2).		
					0.2			(49.0-50.0') SAND, fine, little silt, poorly sorted; moist, light yellowish brown (2.5Y 6/4).		
50	-50				0.1			(50.0-52.0') SAND, coarse, subround to subangular, and SILT, non plastic; dry, light yellowish brown (2.5Y 6/4).		
					0.3					
		6	47.0-57.0	NA	0.2			(52.0-55.0') SAND, medium, little silt, poorly sorted; dry, pale brown (2.5Y 7/3).		
					0.2					
					0.1					
					0.2					
55	-55				0.3			(55.0-57.0') SAND, very fine to fine, trace silt, well sorted; dry; light brownish gray (2.5Y 6/2).		
					0.2			(57.0-67.0') SAND, medium, trace silt, well sorted; dry; pale brown (2.5Y 7/3). NOTE: 2' of recovery over a 10' run at 57-67' so lithological description may not be accurate.		
					0.2					
60	-60				0.2					
		7	57.0-67.0	2.0	0.2					
					0.2					

2" PVC well casing (0.0-82.0' bgs)  
 Bentonite Grout (0.0-78.0' bgs)

2" PVC well casing (0.0-82.0' bgs)  
 Bentonite Grout (0.0-78.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 19.0-24.0' and 72.0-87.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.22.14  
**Date Finish:** 8.22.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 19', 72'  
**Water Level Finish (ft. btoc.):** 24', 87'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA

**Borehole Depth (ft. bgs.):** 87.0  
**Surface Elevation:**

**Descriptions By:** Adam Richmond

**Well/Boring ID:** TW-14-06

**Client:** RACER

**Location:** RACER Lansing Plant 3

**Weather Conditions:** Cloudy 84 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
67.0	-70	8	67.0-77.0	5.0	0.2		(67.0-70.0') SAND, very fine, some silt, poorly sorted; dry; white (2.5Y 8/1). NOTE: 50" of recovery at 67-77', so lithological description may not be accurate.			
70.0	-70				0.3		(70.0-72.0') SAND, medium, some silt, trace small pebbles, subangular, poorly sorted; dry; light yellowish brown (2.5Y 6/3).			
72.0	-75				0.2		(72.0-77.0') SAND, fine to medium, some silt, poorly sorted; wet; dark gray (2.5Y 4/1).			
75.0	-75				0.1					Bentonite Grout (0.0-78.0' bgs)
77.0	-80				0.0		(77.0-82.0') SILT, low plasticity, slow dilatancy, and SAND, fine, trace very large pebbles, subround; wet; dark yellowish brown (10YR 4/4).			2" PVC well casing (0.0-82.0' bgs)
80.0	-80				0.1					Bentonite (78.0-79.0' bgs)
82.0	-80	9	77.0-87.0	10.0	0.1		(82.0-87.0') SANDSTONE (weathered bedrock).			#00 K&E "choker" sand (79.0-80.0' bgs)
85.0	-85				0.1					#1 K&E filter sand (80.0-87.0' bgs)
	-85				0.1					2" stainless steel 0.1 slot well screen (82.0-87.0' bgs)
					0.2					
					0.1					
								End of boring at 87' bgs.		

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 19.0-24.0' and 72.0-87.0' bgs.  
 No odor or staining observed.



**Date Start:** 8.22.14  
**Date Finish:** 8.25.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 17', 24.5', 30, 55', 71'  
**Water Level Finish (ft. btoc.):** 22', 27', 32, 56', 83.5'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 87.0  
**Surface Elevation:**  
**Descriptions By:** A. Richmond/J. Ness

**Well/Boring ID:** TW-14-07  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Cloudy 84 F, Sunny 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									Steel stick up casing (3.0-0.0' above ground surface)
0.0					NA			(0.0-1.0') CONCRETE		
0.0					0.0	X		(1.0-17.0') CLAY, medium plasticity, slow dilatancy, little sand, little medium pebbles, subround to suangular; dry, hard; yellowish brown (10YR 5/6). NOTE: FILL.		2" PVC well casing (0.0-83.0' bgs) Bentonite Grout (0.0-79.0' bgs)
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
0.0					0.0	X				
13.0					0.0	X		NOTE: Transition to TILL; dark grayish brown (2.5Y 4/2) at 13' bgs.		
17.0		1	0.0-7.0	7.0						
71.0		2	7.0-17.0	NA						



**Remarks:** bgs = below ground surface  
 Groundwater encountered from 17.0-22.0', 24.5-27.0', 30.0-32.0', 55.0-56.0 and 71.0-83.5' bgs.  
 No odor or staining observed.

**Date Start:** 8.22.14  
**Date Finish:** 8.25.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotasonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotasonic  
**Water Level Start (ft. bgs.):** 17', 24.5', 30, 55', 71'  
**Water Level Finish (ft. btoc.):** 22', 27', 32, 56', 83.5'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 87.0  
**Surface Elevation:**  
**Descriptions By:** A. Richmond/J. Ness

**Well/Boring ID:** TW-14-07  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Cloudy 84 F, Sunny 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0.0							X			
0.0							X			
0.0							X			
0.0							X			
0.0								(7.0-19.0') SAND, medium, little silt, trace small pebbles, subround to subangular, poorly sorted; wet; light olive brown (2.5Y 5/4).		
0.0								(19.0-22.0') SAND, medium, some silt, trace small pebbles, subangular, poorly sorted; wet; light olive brown (2.5Y 5/4).		
0.0								(22.0-24.5') CLAY, medium plasticity, slow dilatancy, little sand; little small pebbles, subround; dry, stiff; dark gray (2.5Y 4/1).		
0.0								(24.5-25.0') PEBBLES, small, angular, little coarse sand, subround to subangular, poorly sorted; wet; dark grayish brown (2.5Y 4/2).		
0.0								(25.0-27.0') SAND, medium, and CLAY, non plastic, rapid dilatancy, little medium pebbles, subangular to subround; wet, dark gray (2.5Y 4/1).		
0.0								(27.0-32.0') CLAY, medium plasticity, rapid dilatancy, little sand, little medium pebble, subangular to subround; dry, stiff; dark gray (2.5Y 4/1). NOTE: transition to wet at 30' bgs.		
0.0								(32.0-34.0') SAND, fine, some silt, poorly sorted; moist; light olive brown (2.5Y 5/4).		

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 17.0-22.0', 24.5-27.0', 30.0-32.0', 55.0-56.0 and 71.0-83.5' bgs.  
 No odor or staining observed.



**Date Start:** 8.22.14  
**Date Finish:** 8.25.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 17', 24.5', 30, 55', 71'  
**Water Level Finish (ft. btoc.):** 22', 27', 32, 56', 83.5'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 87.0  
**Surface Elevation:**  
**Descriptions By:** A. Richmond/J. Ness

**Well/Boring ID:** TW-14-07  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Cloudy 84 F, Sunny 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
35	-35				0.0		(34.0-37.0') SAND, fine, little silt, trace granules, subround to subangular, poorly sorted; dry; light gray (2.5Y 7/2).			
					0.0					
					0.0					
					0.2		(37.0-39.0') SAND, medium to coarse, subround to subangular, little medium pebbles, subangular, poorly sorted; moist; light olive brown (2.5Y 5/4).			
					0.1					
					0.2		(39.0-41.0') SAND, fine to medium, little silt, little medium pebbles, subround to subangular, poorly sorted; dry; light gray (2.5Y 7/2).			
40	-40	5	37.0-43.0	6.0	0.2					
					0.2		(41.0-43.0') SAND, very fine, little silt, trace small pebbles, subround, poorly sorted; dry; white (2.5Y 8/1).			
					0.1					
					0.1		(43.0-47.0') PEBBLES, large, subround to subangular, little fine to medium sand, little small pebbles, subangular to subround, poorly sorted; dry; light yellowish brown (2.5Y 6/3).			
					0.2					
					0.2					
					0.1					
45	-45				0.1					
					0.2					
					0.2					
					0.1					
					0.1		(47.0-48.0') SAND, very fine to fine, little silt, trace granule, subround to subangular, poorly sorted; dry; light gray (2.5Y 7/2).			
					0.1					
					0.2		(48.0-48.5') SILT, non plastic, no dilatancy, and SAND, fine; moist; light olive brown (2.5Y 5/4).			
					0.1		(48.5-51.5') SAND, very fine to fine, little silt, trace granules, subround to subangular, poorly sorted; dry; white (2.5Y 5/4).			
					0.1					
50	-50				0.1					
					0.1		(51.5-52.0') SILT, non plastic, no dilatancy and SAND, fine; moist; light olive brown (2.5Y 5/4).			
					0.1		(52.0-55.0') SAND, fine to medium, little silt, poorly sorted; moist; light yellowish brown (2.5Y 6/3).			

2" PVC well casing (0.0-83.0' bgs)  
 Bentonite Grout (0.0-79.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 17.0-22.0', 24.5-27.0', 30.0-32.0', 55.0-56.0 and 71.0-83.5' bgs.  
 No odor or staining observed.



**Date Start:** 8.22.14  
**Date Finish:** 8.25.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 17', 24.5', 30, 55', 71'  
**Water Level Finish (ft. btoc.):** 22', 27', 32, 56', 83.5'

**Northing:**  
**Eastings:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 87.0  
**Surface Elevation:**  
**Descriptions By:** A. Richmond/J. Ness

**Well/Boring ID:** TW-14-07  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Cloudy 84 F, Sunny 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
55	-55	7	52.0-57.0	5.0	0.2			(55.0-56.0') SILT, non plastic, rapid dilatancy, some sand; wet, stiff; dark gray (2.5Y 4/1).		<p>2" PVC well casing (0.0-83.0' bgs) Bentonite Grout (0.0-79.0' bgs)</p>
					0.2			(56.0-58.5) SAND, medium, little large pebbles, subround, little silt, poorly sorted; moist; grayish brown (2.5Y 5/2).		
					3.1					
					1.6			(58.5-68.0') SAND, very fine to fine, little silt, well sorted; dry; light gray (10YR 7/2).		
60	-60	8	57.0-62.0	5.0	3.3					
					2.9					
					3.1					
					6.6					
					1.7					
65	-65	9	62.0-67.0	5.0	0.7					
					2.8					
					1.7					
					0.3			(68.0-71.0') SAND, fine, trace medium sand, and SILT, non plastic, rapid dilatancy; moist; gray brown (10YR 5/2).		
					1.6					
					2.6					
70	-70				0.0			(71.0-83.5') SILT, non plastic, rapid dilatancy, some sand, fine to medium, trace small pebbles, angular; wet; grayish brown (10YR 5/2). NOTE: TILL.		
					0.0					

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 17.0-22.0', 24.5-27.0', 30.0-32.0', 55.0-56.0 and 71.0-83.5' bgs.  
 No odor or staining observed.



**Date Start:** 8.22.14  
**Date Finish:** 8.25.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 17', 24.5', 30, 55', 71'  
**Water Level Finish (ft. btoc.):** 22', 27', 32, 56', 83.5'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 87.0  
**Surface Elevation:**  
**Descriptions By:** A. Richmond/J. Ness

**Well/Boring ID:** TW-14-07  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Cloudy 84 F, Sunny 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
75	-75	10	67.0-77.0	9.8	0.0					Bentonite Grout (0.0-79.0' bgs)
					0.0					2" PVC well casing (0.0-83.0' bgs)
					0.0					Bentonite (79.0-80.0' bgs)
					0.0					#00 K&E "choker" sand (80.0-81.0' bgs)
		11	77.0-87.0	NA	0.0			(83.5-87.0') SANDSTONE (weathered bedrock).		#1 K&E filter sand (81.0-89.0' bgs)
					0.0					2" stainless steel 0.1 slot well screen (83.0-88.0' bgs)
					0.0			End of boring at 87' bgs.		
90	-90									

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 17.0-22.0', 24.5-27.0', 30.0-32.0', 55.0-56.0 and 71.0-83.5' bgs.  
 No odor or staining observed.



**Date Start:** 8.25.14  
**Date Finish:** 8.26.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 18.2, 47.0, 77.0  
**Water Level Finish (ft. btoc.):** 26.3, 50.5, 84.5

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 89.0  
**Surface Elevation:**  
**Descriptions By:** James Ness

**Well/Boring ID:** TW-14-08  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Overcast, 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									Steel stick up casing (3.0-0.0' above ground surface)
0.0					0.0			(0.0-1.0') CONCRETE		
0.3								(1.0-14.5') CLAY, medium plasticity, no dilatancy, little sand, fine to medium, little granule to small pebbles, round; dry, very stiff, yellow brown (10YR 5/4).		
0.5										
0.0		1	0.0-7.0	7.0	0.2					
0.0					0.0					
0.0					0.0					
0.2					0.2					2" PVC well casing (0.0-84.0' bgs) Bentonite Grout (0.0-80.0' bgs)
0.0					0.0					
0.0					0.0					
0.0					0.0					
0.0					0.0					
0.0		2	7.0-17.0	9.5	0.0					
0.3					0.3					
0.2					0.2					
0.2					0.2			(14.5-18.2') CLAY, medium plasticity, no dilatancy, little granule to medium pebbles.		

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 18.2-26.3', 47.0-50.5', and 77.0-84.5'  
 No odor or staining observed.



**Date Start:** 8.25.14  
**Date Finish:** 8.26.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 18.2, 47.0, 77.0  
**Water Level Finish (ft. btoc.):** 26.3, 50.5, 84.5

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 89.0  
**Surface Elevation:**  
**Descriptions By:** James Ness

**Well/Boring ID:** TW-14-08  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Overcast, 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
18.2								round to subround, trace sand, fine to medium; dry, stiff, yellow brown (10YR 5/4).		
18.2-19.0							(18.2-19.0') SAND, fine to medium, little silt, trace very coarse sand to granule, round, poorly sorted; wet; yellow brown (10YR 5/6).			
19.0-22.0							(19.0--22.0') SILT, non plastic, rapid dilatancy, little sand, fine; wet, stiff to medium stiff; yellow brown (10YR 5/6).			
22.0-26.3		3	17.0 27.0	9.42			(22.0-26.3') SAND, medium, and CLAY, medium plasticity, no dilatancy, trace medium to coarse sand, round; poorly sorted; wet, gray (10YR 5/1).			
26.3-31.5							(26.3-31.5) CLAY, high plasticity, no dolatancy, little small to medium pebbles, round to subround, some medium sand; dry, stiff; dark gray brown (10YR 4/2).			
31.5-32.0							(31.5-32.0') SILT, non plastic, rapid dilatancy; moist, stiff; dark gray brown (10YR 4/2).			
32.0-37.0		4	27.0- 37.0	NA			(32.0-37.0') SAND, fine to medium, trace coarse sand, subround, well sorted; dry, brown (10YR 5/3).			

2" PVC well casing (0.0-84.0' bgs)  
 Bentonite Grout (0.0-80.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 18.2-26.3', 47.0-50.5', and 77.0-84.5'  
 No odor or staining observed.



**Date Start:** 8.25.14  
**Date Finish:** 8.26.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 18.2, 47.0, 77.0  
**Water Level Finish (ft. btoc.):** 26.3, 50.5, 84.5

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 89.0  
**Surface Elevation:**  
**Descriptions By:** James Ness

**Well/Boring ID:** TW-14-08  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Overcast, 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
35	-35				0.2					
					0.1					
					0.4					
		5	37.0-47.0	7.75	0.2			(37.0-45.5') SAND, medium to coarse, round, little granules, trace small to medium pebbles, round to subround, poorly sorted; dry; yellowish brown (10YR 5/4).		
					0.0					
40	-40				0.0					
					0.1					
					0.0					
					0.0					
					0.0					
45	-45				0.0			(45.5-47.0') SAND, fine, little silt, trace medium sand, well sorted; dry; yellow brown (10YR 5/4).		
					0.0					
					0.1			(47.0-50.5') SAND, fine to medium, some very coarse sand to fine granules, round, trace small to medium pebbles, round to subround, trace clay, poorly sorted; wet; very pale brown (10YR 7/3).		
					0.1					
					0.3					
50	-50				0.2			(50.5-53.5') SAND, very fine, and SILT, non plastic, rapid dilatancy, well sorted; dry; very pale brown (10YR 7/3).		
		6	47.0-57.0	NA	0.2					
					0.2					
					0.8					

2" PVC well casing (0.0-84.0' bgs)  
 Bentonite Grout (0.0-80.0' bgs)

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 18.2-26.3', 47.0-50.5', and 77.0-84.5'  
 No odor or staining observed.



**Date Start:** 8.25.14  
**Date Finish:** 8.26.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 18.2, 47.0, 77.0  
**Water Level Finish (ft. btoc.):** 26.3, 50.5, 84.5

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 89.0  
**Surface Elevation:**  
**Descriptions By:** James Ness

**Well/Boring ID:** TW-14-08  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Overcast, 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
55	-55				0.3			(53.5-67.0) SAND, very fine, trace silt, trace medium pebbles, round, well sorted; dry; gray brown (10YR 5/2). NOTE: moist at 64.5' bgs.		
					0.0					
					0.0					
					0.1					
					0.0					
					0.7					
					0.3					
					0.3					
					0.4					
		7	57.0-67.0	10.0	0.5					
					0.2			(67.0-68.5) SAND, fine to medium, some granules to medium pebbles, round to subround, little clay, poorly sorted; moist; brown (10YR 5/3).		
					0.7					
					0.2					
					0.1			(68.5-71.0) SAND, fine, trace silt, trace medium pebbles, round, well sorted; dry; gray brown (10YR 5/2).		
					0.2					
					0.1					
					0.6			(71.0-72.0) SAND, fine to medium, some granule to small pebbles, round, trace silt, trace medium pebbles, round to subround, poorly sorted; dry; brown (10YR 5/3).		
					0.5					
					1.3					
70	-70				0.3					
					1.2					

**Remarks:** bgs = below ground surface  
 Groundwater encountered from 18.2-26.3', 47.0-50.5', and 77.0-84.5'  
 No odor or staining observed.

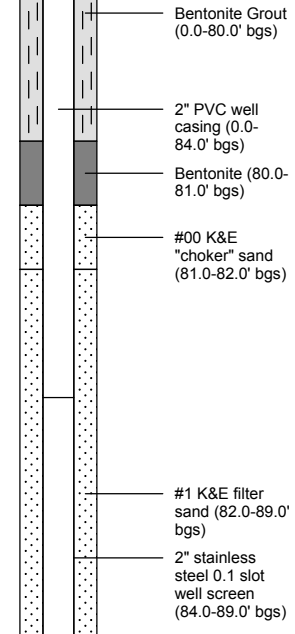


**Date Start:** 8.25.14  
**Date Finish:** 8.26.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 18.2, 47.0, 77.0  
**Water Level Finish (ft. btoc.):** 26.3, 50.5, 84.5

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 89.0  
**Surface Elevation:**  
  
**Descriptions By:** James Ness

**Well/Boring ID:** TW-14-08  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
  
**Weather Conditions:** Overcast, 83 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
75 -75		8	67.0-77.0	9.0	0.2		(72.0-75.5') SAND, fine, trace silt, well sorted; dry; gray (10YR 5/1). NOTE: moist at 74.0' bgs.			
					0.2					
					0.1					
					0.0					
					0.0			(75.5-77.0') SILT, non plastic, rapid dilatancy, trace very fine sand; moist, stiff to very stiff; light brown gray (10YR 6/2).		
					0.2			(77.0-80.0') SAND, fine, and SILT, non plastic, rapid dilatancy, trace medium to coarse sand, round, poorly sorted; wet; gray brown (10YR 5/2).		
					0.1					
80 -80					0.1					
					NA			(80.0-84.5') SILT, non plastic, rapid dilatancy, little clay, trace sand, fine; wet, medium stiff; brown (10YR 5/2).		
		9	77.0-87.0	NA	NA					
					NA					
					NA					
					NA					
					NA					
85 -85					NA			(84.5-87.0') SANDSTONE (weathered bedrock).		
					NA					
					NA					
					NA					
		10	87.0-89.0	NA	NA					
					NA					
					NA					
90 -90								End of boring at 89.0' bgs.		



**Remarks:** bgs = below ground surface  
 Groundwater encountered from 18.2-26.3', 47.0-50.5', and 77.0-84.5'  
 No odor or staining observed.





**Date Start:** 8.26.14  
**Date Finish:** 8.26.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 19', 69.5'  
**Water Level Finish (ft. btoc.):** 24', 84.5'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
**Borehole Depth (ft. bgs.):** 89.0  
**Surface Elevation:**  
**Descriptions By:** James Ness

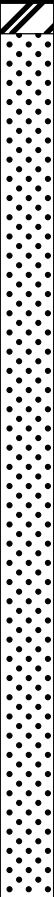



**Well/Boring ID:** TW-14-09  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
**Weather Conditions:** Cloudy 75 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headpace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction		
19.0	-20.0	3	17.0 27.0	10.0	0.1							
19.5												
20.0										(19.0-21.5') SAND, very fine, and SILT, non plastic, rapid dilatancy; wet, soft; light yellow brown (10YR 6/2).		
20.5										(21.5-23.5') SAND, very fine, trace silt, well sorted; wet; gray (10YR 5/1).		
21.0								(23.5-24.0') SAND, medium to coarse, little very coarse sand to granule, trace clay, poorly sorted; wet, gray (10YR 5/1).				
21.5								(24.0-34.5') CLAY, high plasticity, no dilatancy, little granule to small pebbles, round to subround, trace medium sand; moist; gray (10YR 5/1).				
22.0												
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**Remarks:** bgs = below ground surface  
 Groundwater encountered from 19.0-24.0', 68.0-84.5' bgs.  
 No odor or staining observed.



<b>Date Start:</b> 8.26.14 <b>Date Finish:</b> 8.26.14 <b>Drilling Company:</b> Cascade <b>Driller's Name:</b> Scott/Ralph/Jose <b>Drilling Method:</b> Rotosonic <b>Sampling Method:</b> Core Barrel <b>Rig Type:</b> Rotosonic <b>Water Level Start (ft. bgs.):</b> 19', 69.5' <b>Water Level Finish (ft. btoc.):</b> 24', 84.5'	<b>Northing:</b> <b>Easting:</b> <b>Casing Elevation:</b> NA  <b>Borehole Depth (ft. bgs.):</b> 89.0 <b>Surface Elevation:</b>  <b>Descriptions By:</b> James Ness	<b>Well/Boring ID:</b> TW-14-09 <b>Client:</b> RACER <b>Location:</b> RACER Lansing Plant 3  <b>Weather Conditions:</b> Cloudy 75 F
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DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
35	-35				0.0			(34.5-48.0') SAND, fine to medium, trace very coarse sand to granules, poorly sorted; dry; yellow brown (10YR 5/4).  NOTE: Coarse to very coarse sand from 37.0-38.5' bgs.		
40	-40	5	37.0-42.0	5.0	0.0 0.1 0.2 0.3 0.5					
45	-45				0.1 0.2 0.1 0.0 0.0 0.0					
50	-50	6	42.0-57.0	11.25	0.0 0.0 0.0 0.0			(48.0-51.0') SILT, non plastic, rapid dilatancy, trace very fine sand; dry, stiff; brown (10YR 5/3).		
					0.0			(51.0-52.5') SILT, non plastic, rapid dilatancy, little granules to medium pebbles, round to subround, trace sand, fine to medium; dry, very stiff; dark gray brown (10YR 4/2).		
					0.0			(52.5-68.0') SAND, very fine, well sorted; dry; grayish brown (10YR 5/2).		

2" PVC well casing (0.0-84.0' bgs)  
Bentonite Grout (0.0-80.0' bgs)

 <b>ARCADIS</b> Infrastructure · Water · Environment · Buildings	<b>Remarks:</b> bgs = below ground surface Groundwater encountered from 19.0-24.0', 68.0-84.5' bgs. No odor or staining observed.
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**Date Start:** 8.26.14  
**Date Finish:** 8.26.14  
**Drilling Company:** Cascade  
**Driller's Name:** Scott/Ralph/Jose  
**Drilling Method:** Rotosonic  
**Sampling Method:** Core Barrel  
**Rig Type:** Rotosonic  
**Water Level Start (ft. bgs.):** 19', 69.5'  
**Water Level Finish (ft. btoc.):** 24', 84.5'

**Northing:**  
**Easting:**  
**Casing Elevation:** NA  
  
**Borehole Depth (ft. bgs.):** 89.0  
**Surface Elevation:**  
  
**Descriptions By:** James Ness

**Well/Boring ID:** TW-14-09  
**Client:** RACER  
**Location:** RACER Lansing Plant 3  
  
**Weather Conditions:** Cloudy 75 F

DEPTH (feet bgs.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
75 -75		8	67.0-77.0	10.0	0.0			(73.0-84.5') SILT, non plastic, no dilatancy, trace very coarse sand to granule, round; wet, stiff; dark gray brown (10YR 4/2).		
80 -80		9	77.0-87.0	6.0	0.0					Bentonite Grout (0.0-80.0' bgs) 2" PVC well casing (0.0-84.0' bgs) Bentonite (80.0-81.0' bgs) #00 K&E "choker" sand (81.0-82.0' bgs)
85 -85					0.0			(84.5-89.0') SANDSTONE (weathered bedrock).		#1 K&E filter sand (82.0-89.0' bgs) 2" stainless steel 0.1 slot well screen (84.0-89.0' bgs)
		10	87.0-89.0	NA	NA					
90 -90								End of boring at 89' bgs.		

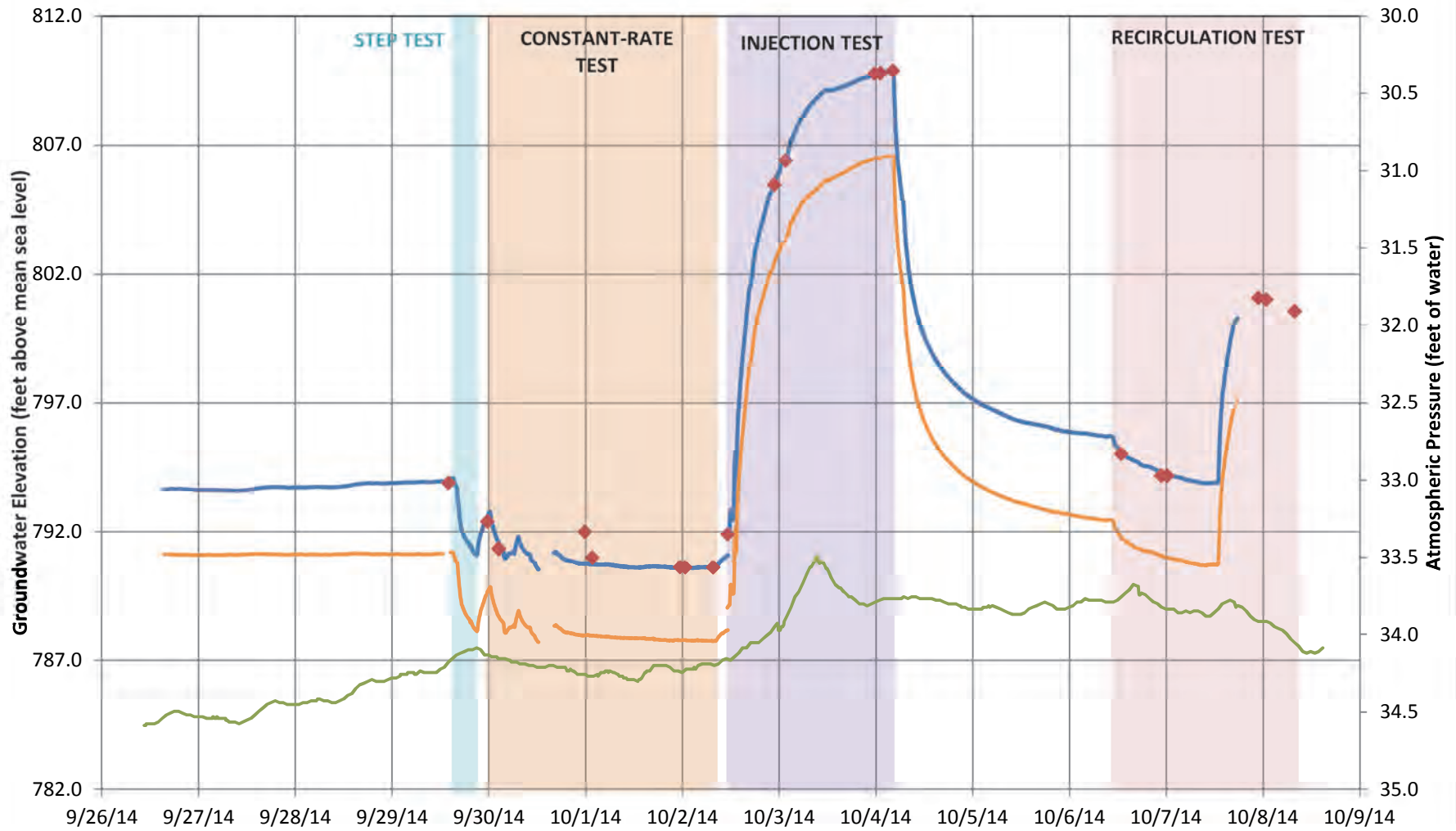
**Remarks:** bgs = below ground surface  
 Groundwater encountered from 19.0-24.0', 68.0-84.5' bgs.  
 No odor or staining observed.






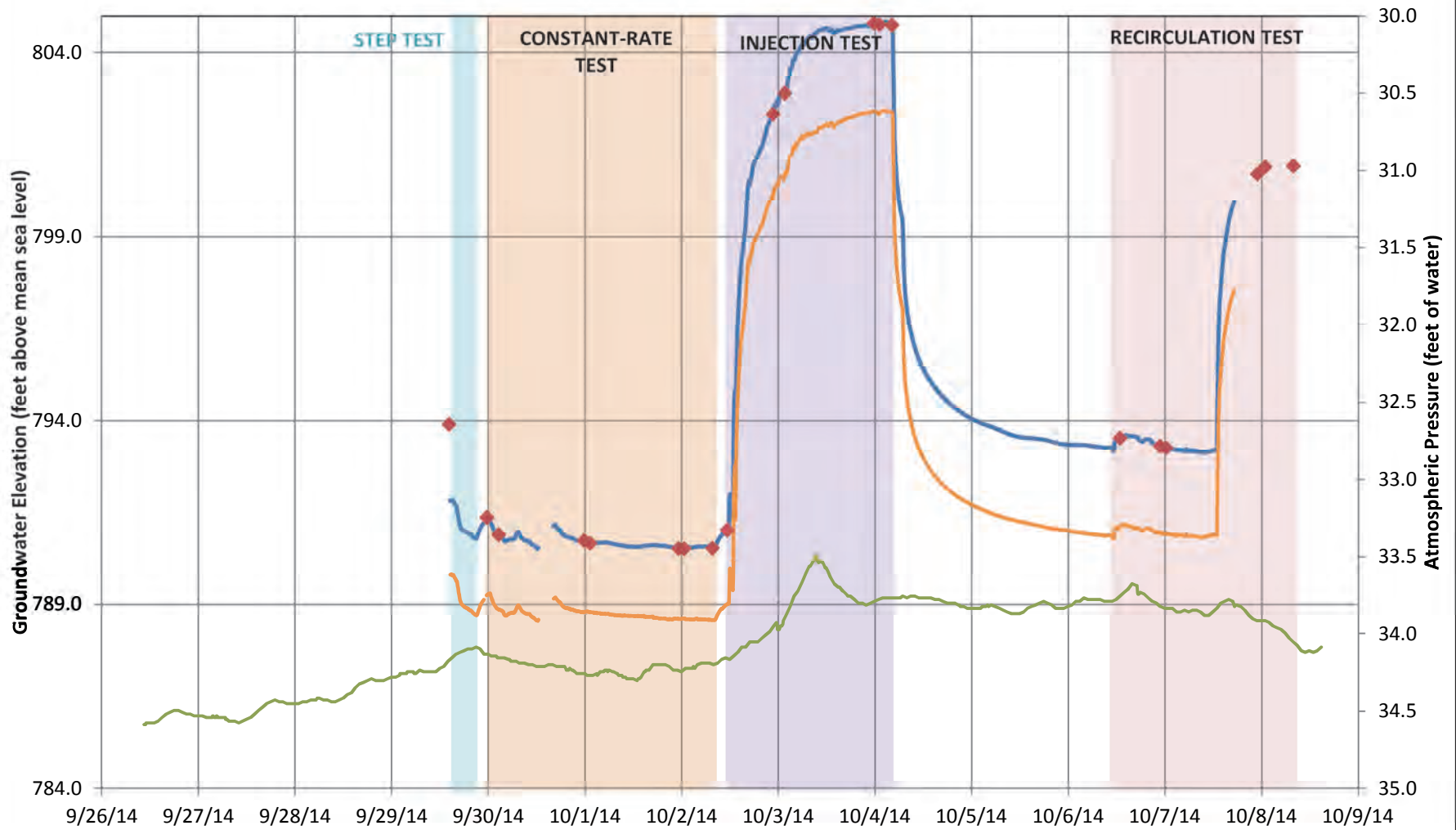
## **Appendix B**

Well Hydrographs



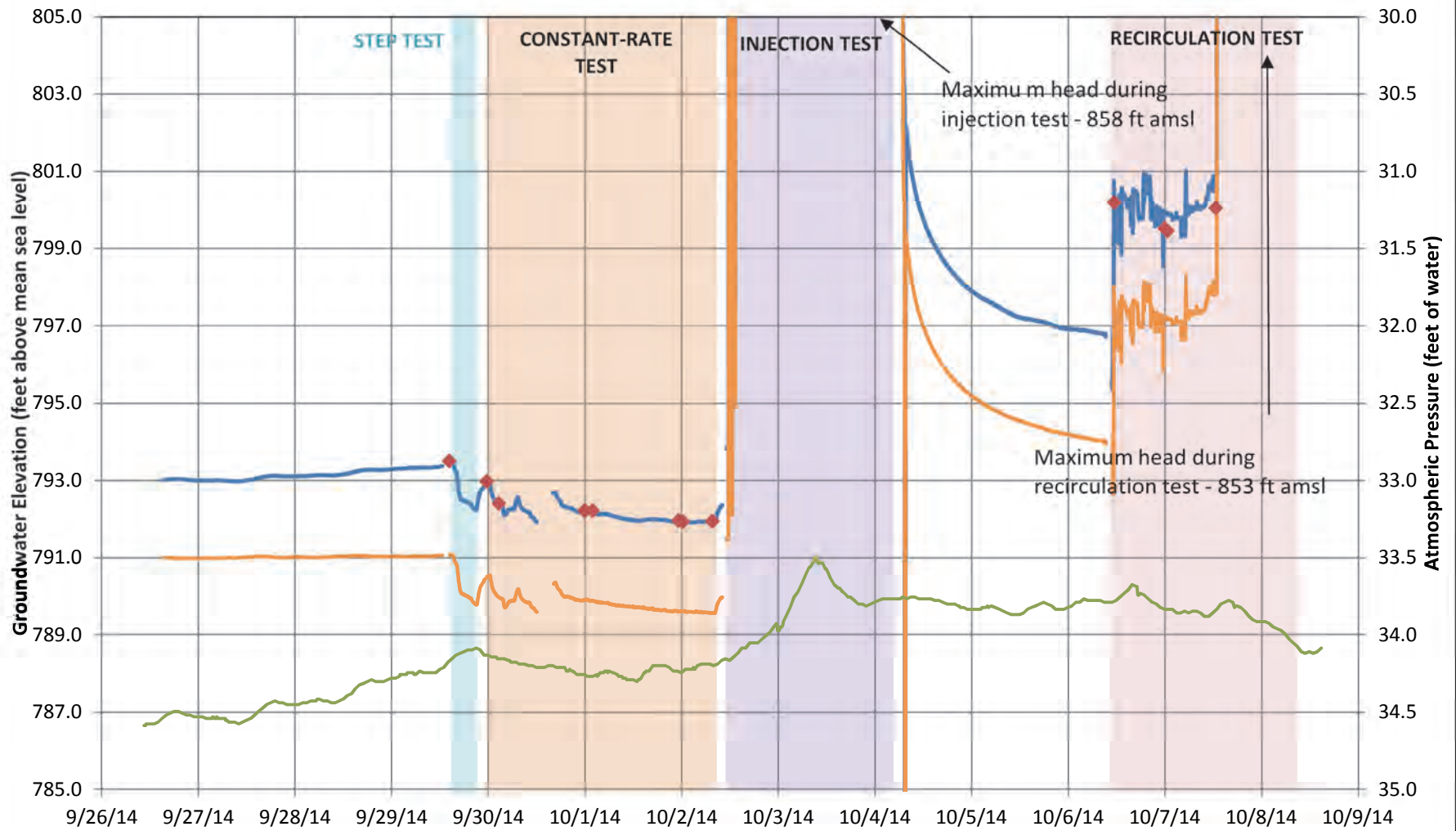
- TW-14-05 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -2.5 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 NORTH LANSING, MICHIGAN	
TW-14-05 Hydrograph	
	




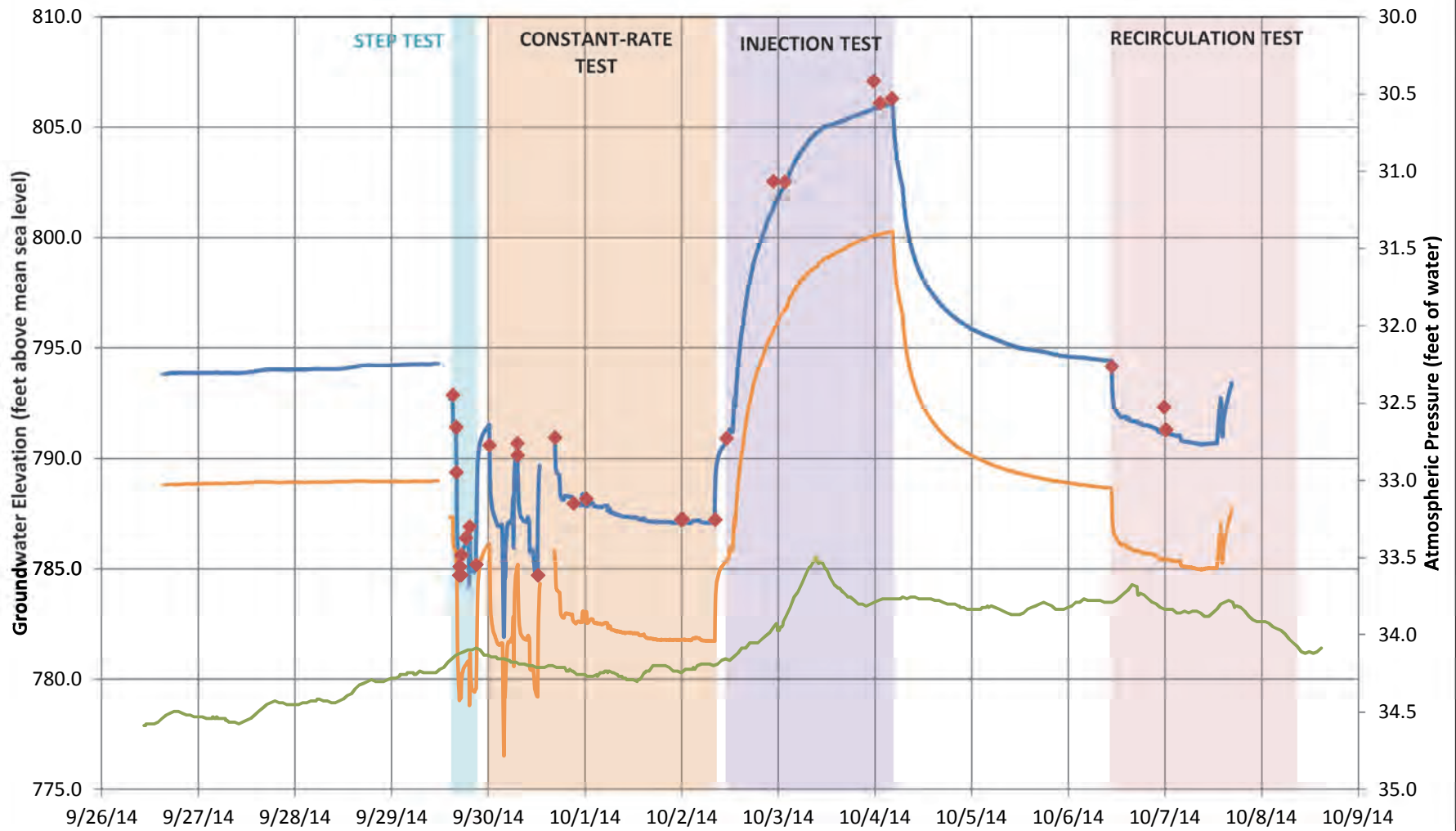
- TW-14-04 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -2 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 NORTH LANSING, MICHIGAN	
TW-14-04 Hydrograph	
	




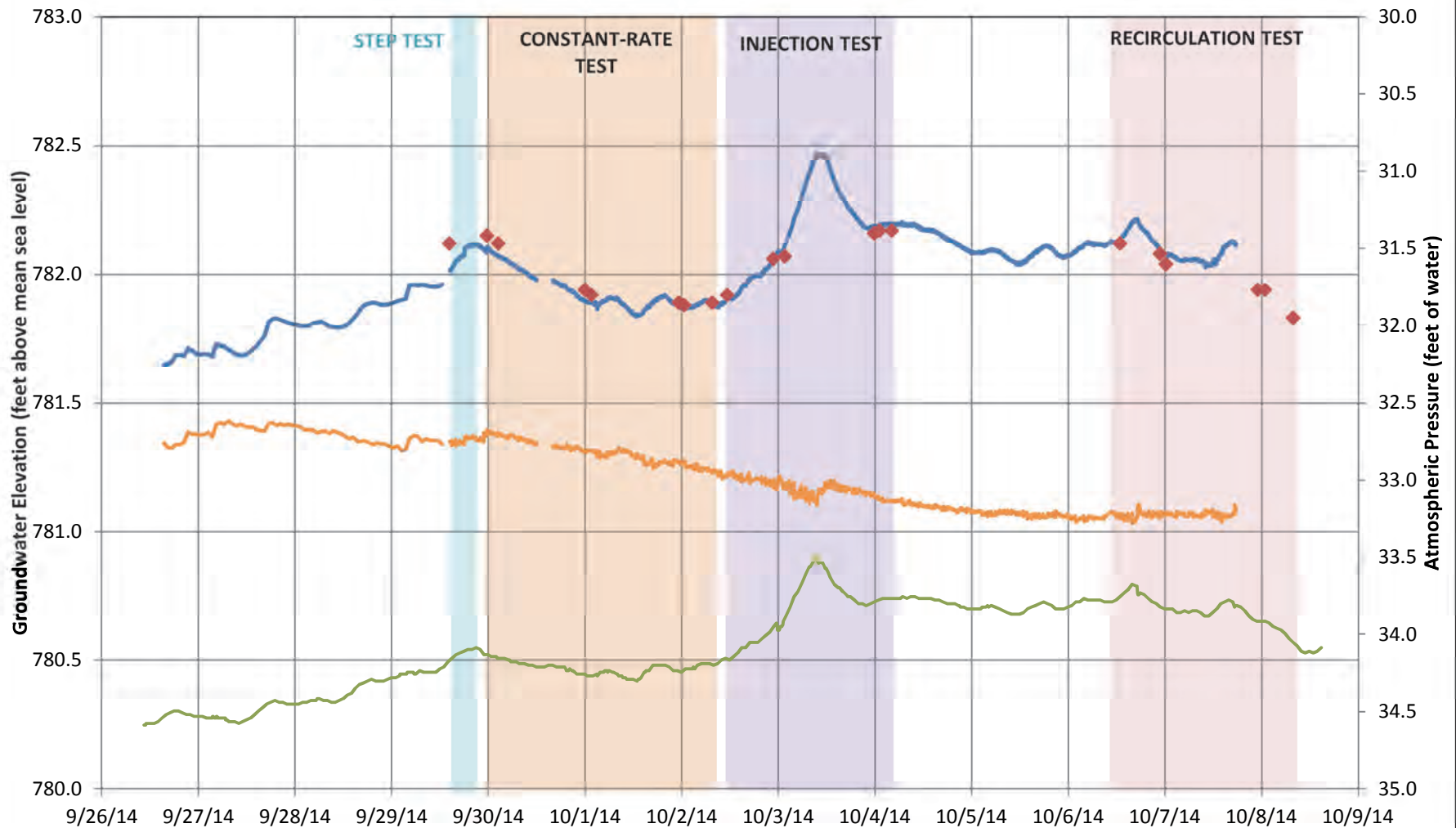
- TW-14-03 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -2 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 NORTH LANSING, MICHIGAN	
TW-14-03 Hydrograph	
	



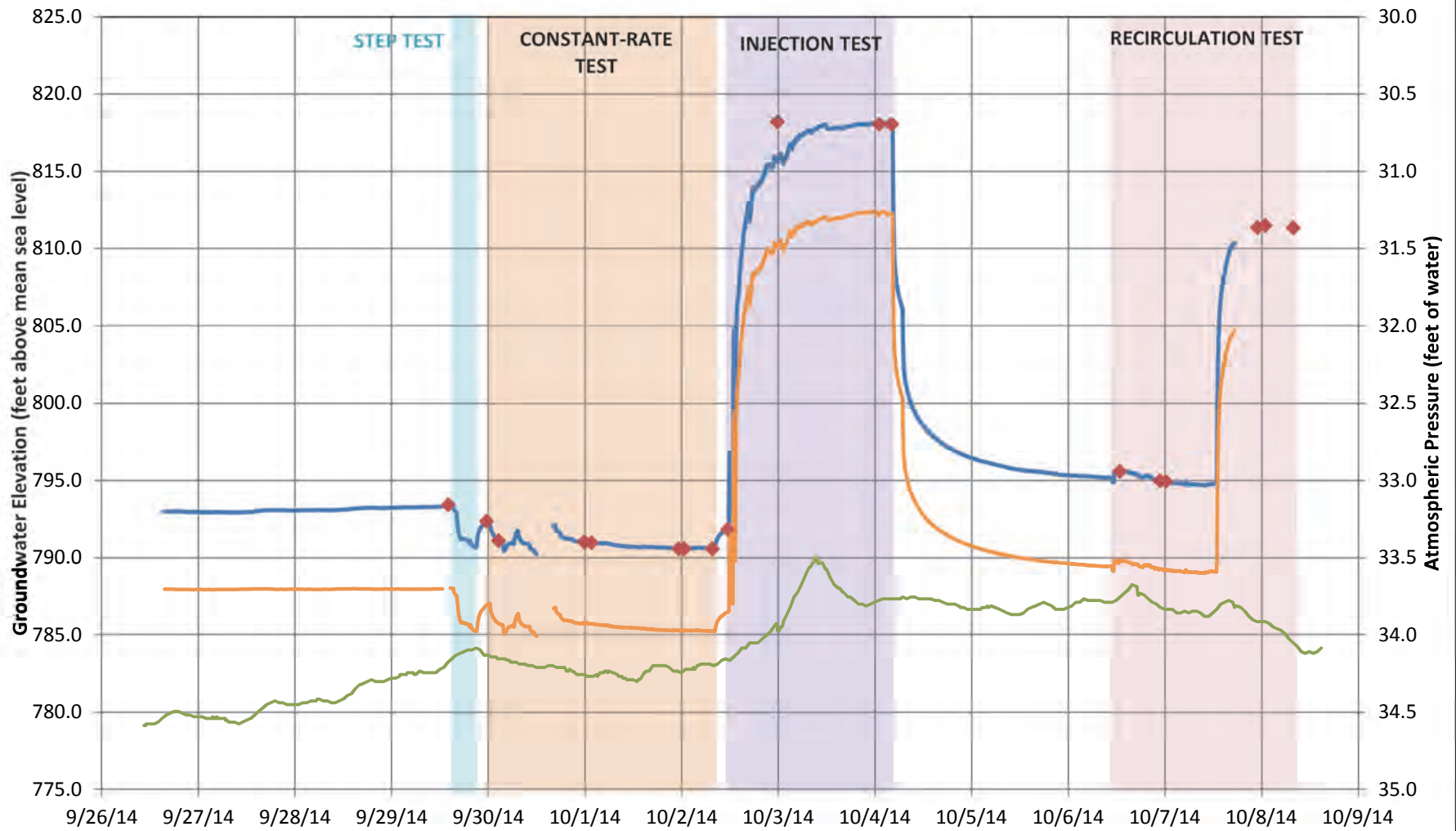
- PW-14-02 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -5 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 NORTH LANSING, MICHIGAN	
PW-14-02 Hydrograph	
	




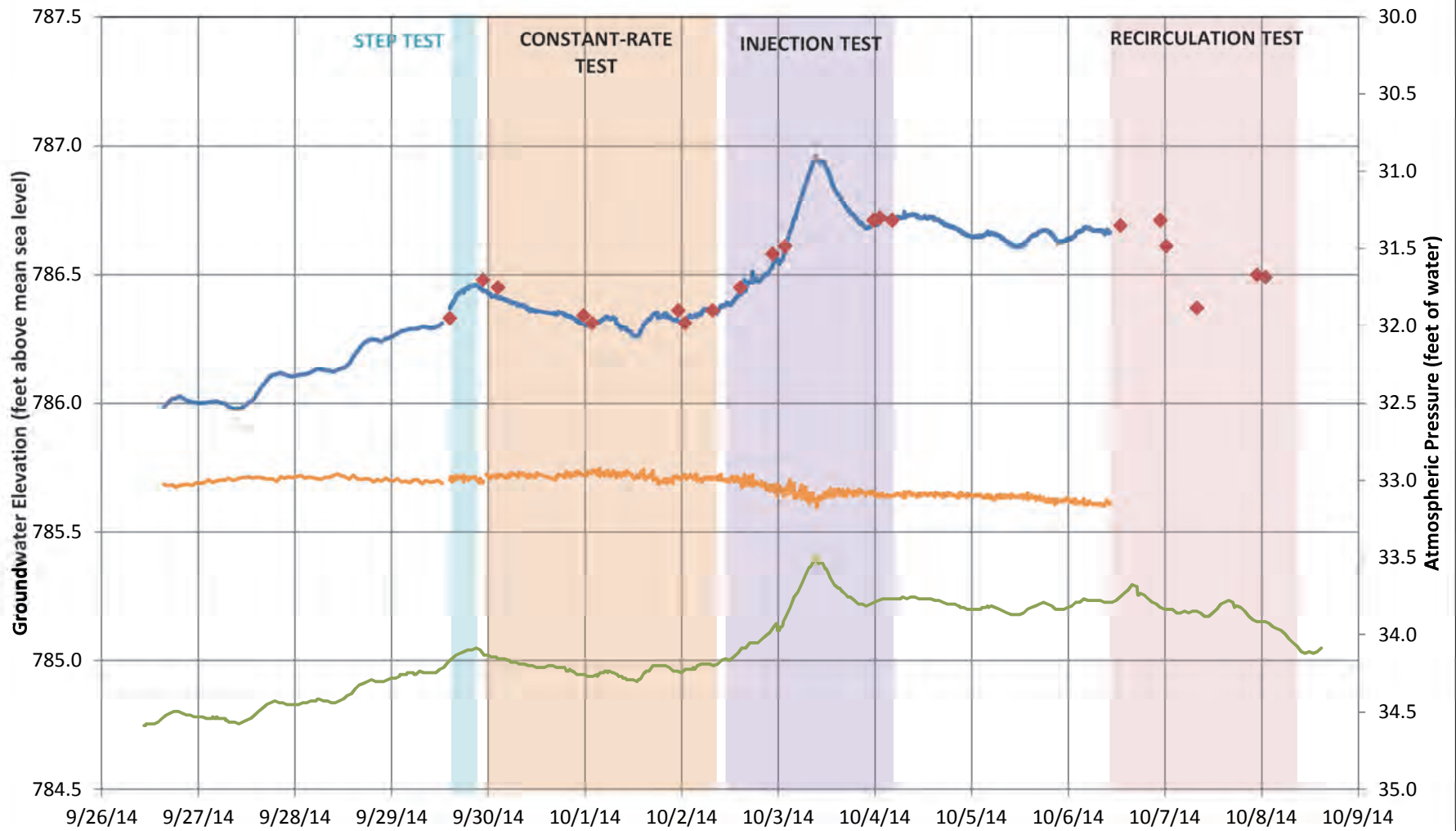
- MW-13-44 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.3 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 NORTH LANSING, MICHIGAN	
MW-13-44 Hydrograph	
	




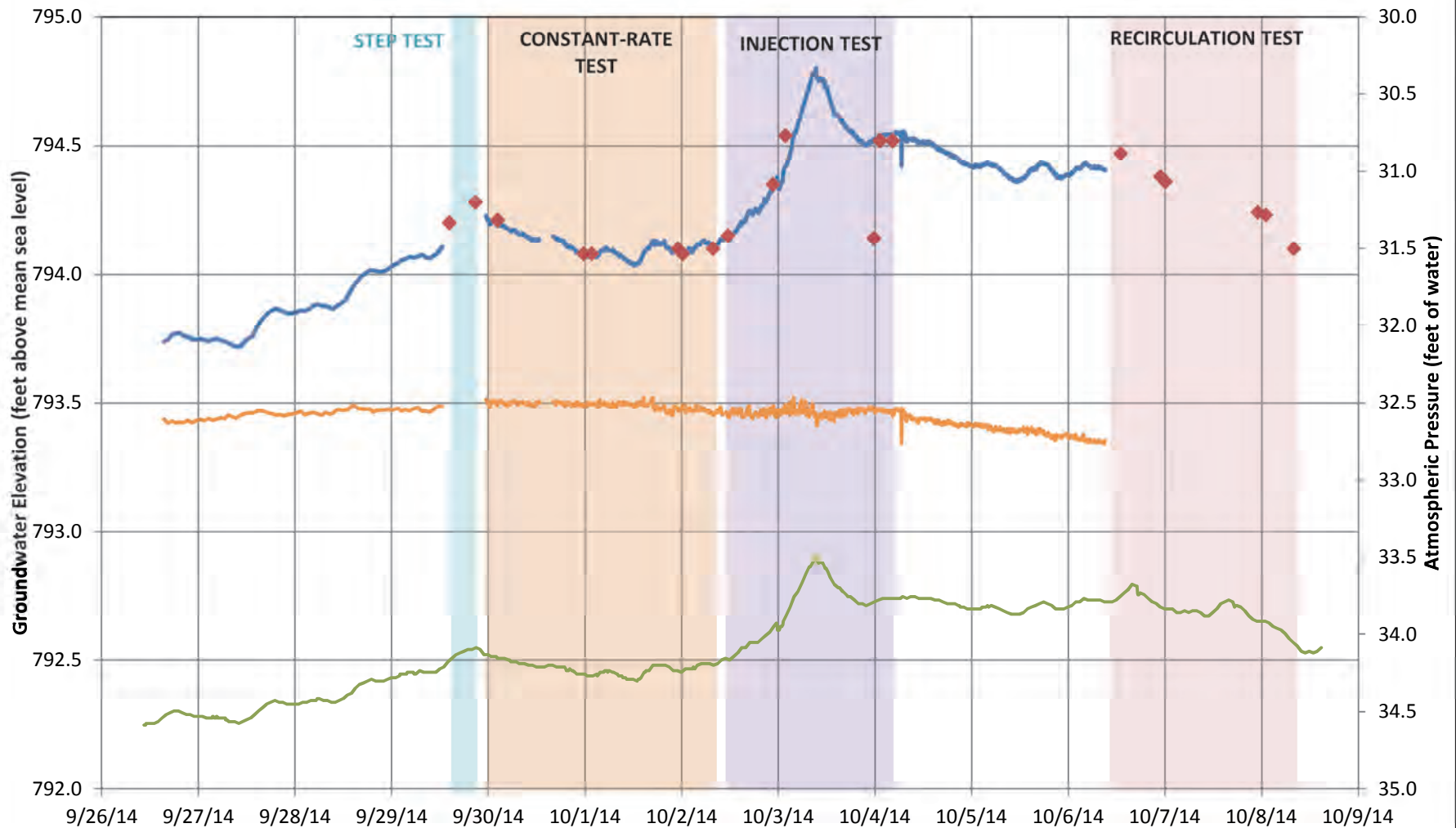
- MW-13-43 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -5 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 NORTH LANSING, MICHIGAN	
MW-13-43 Hydrograph	
	




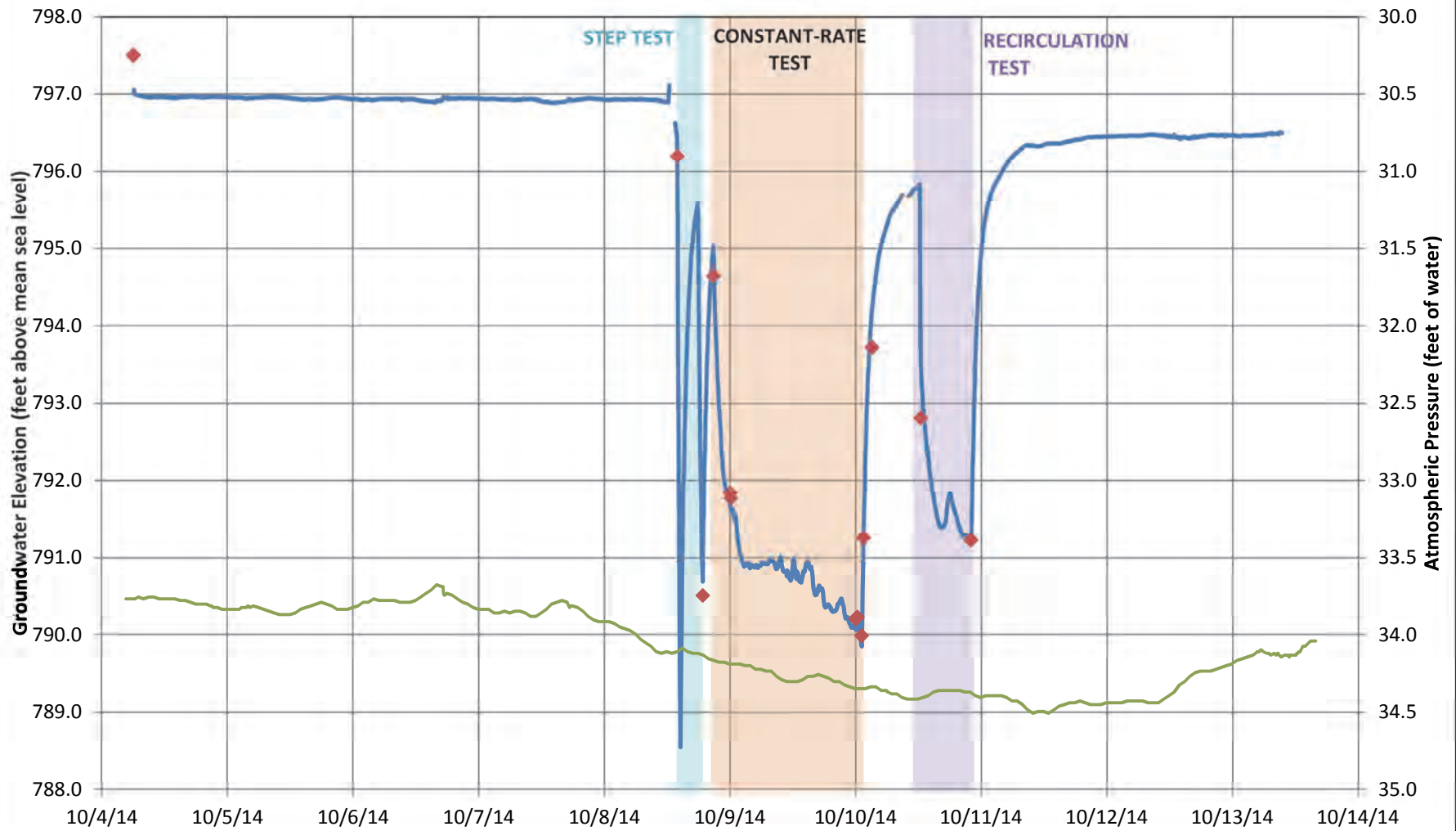
- MW-13-42 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.3 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 NORTH LANSING, MICHIGAN	
MW-13-42 Hydrograph	
	



- MW-13-45 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.3 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 NORTH LANSING, MICHIGAN	
MW-13-45 Hydrograph	
	

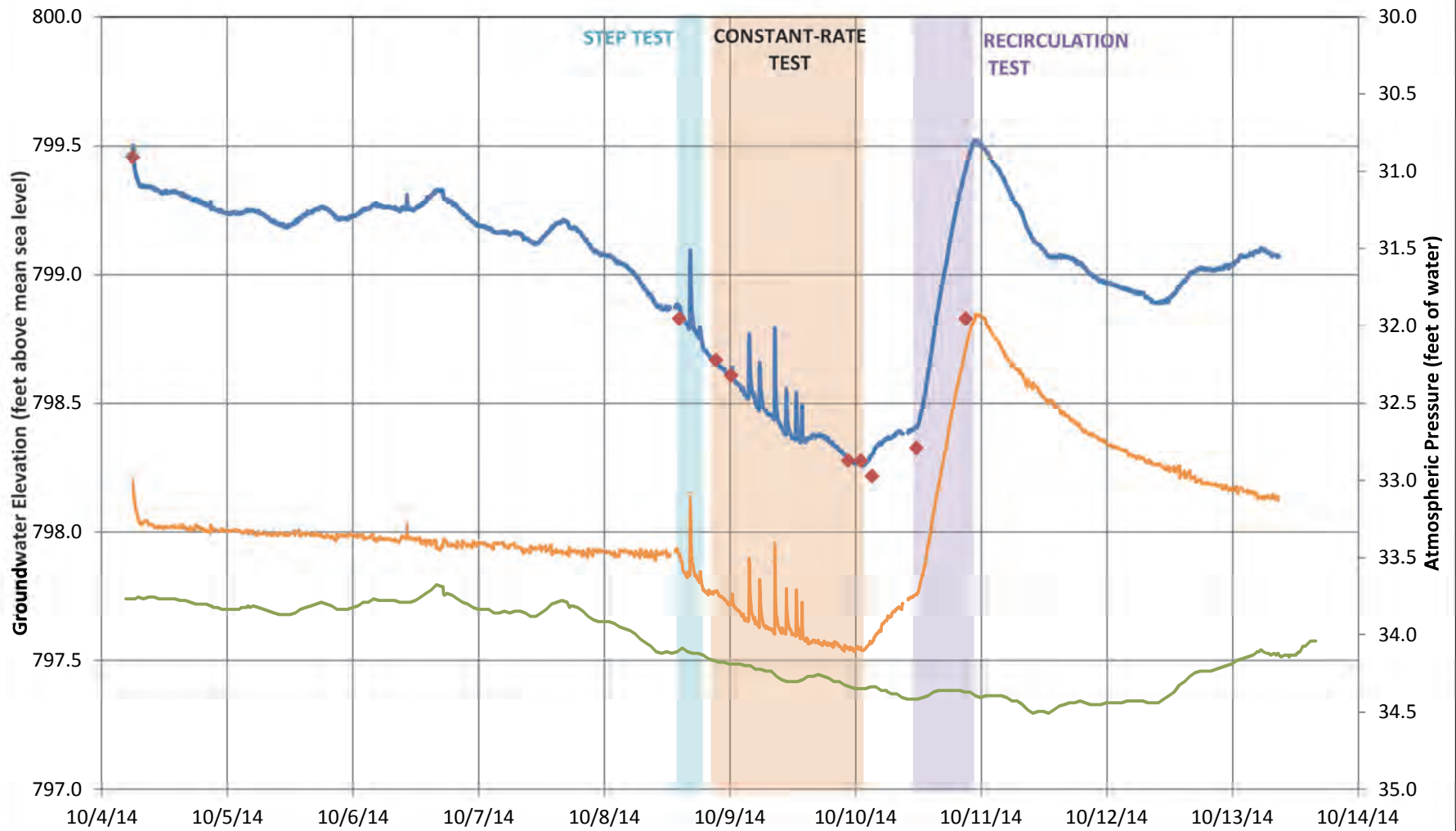


- PW-14-01 Groundwater Elevation
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 SOUTH  
LANSING, MICHIGAN

PW-14-01 Hydrograph



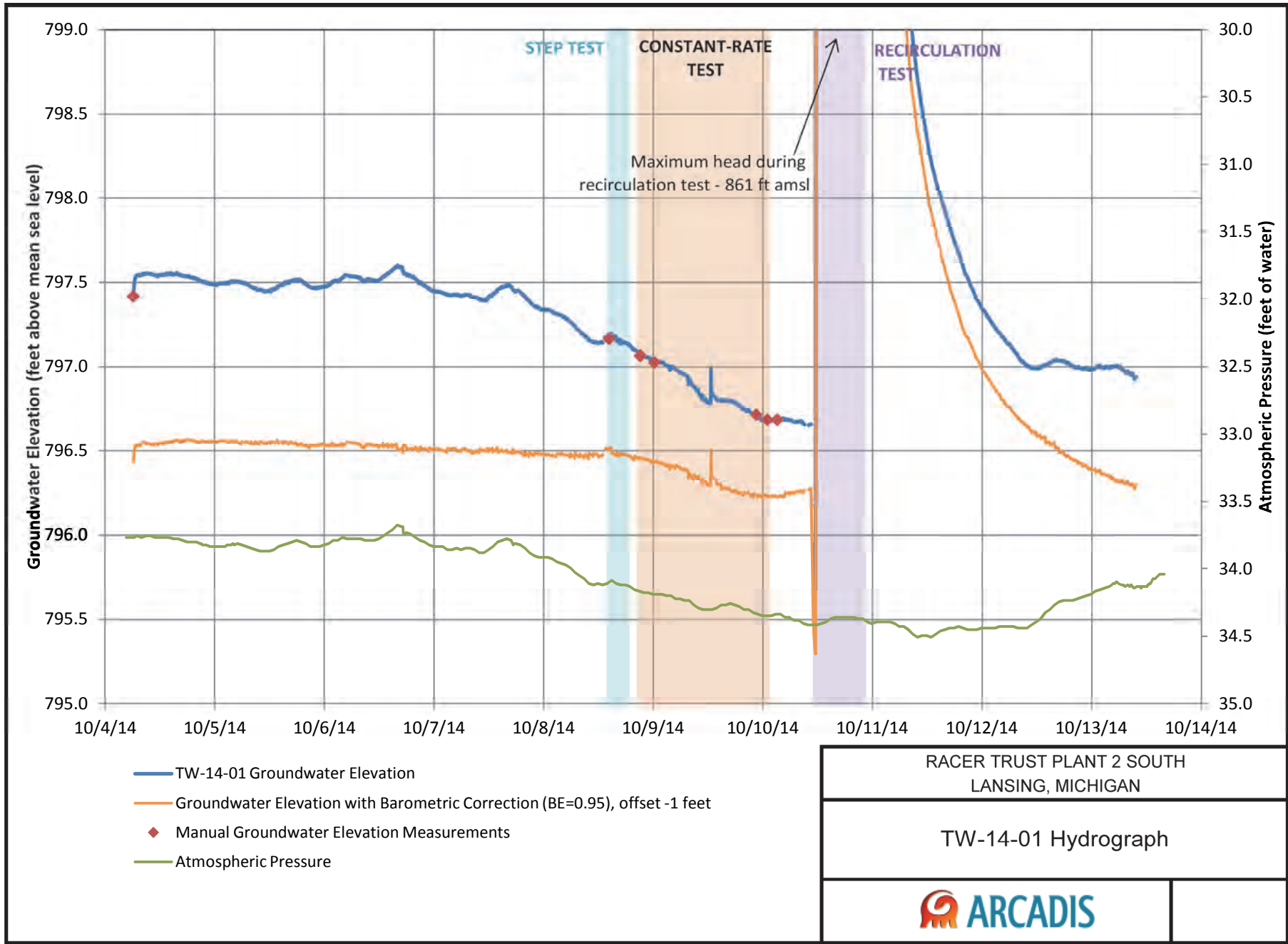


- TW-14-02 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -1.3 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure


RACER TRUST PLANT 2 SOUTH  
LANSING, MICHIGAN

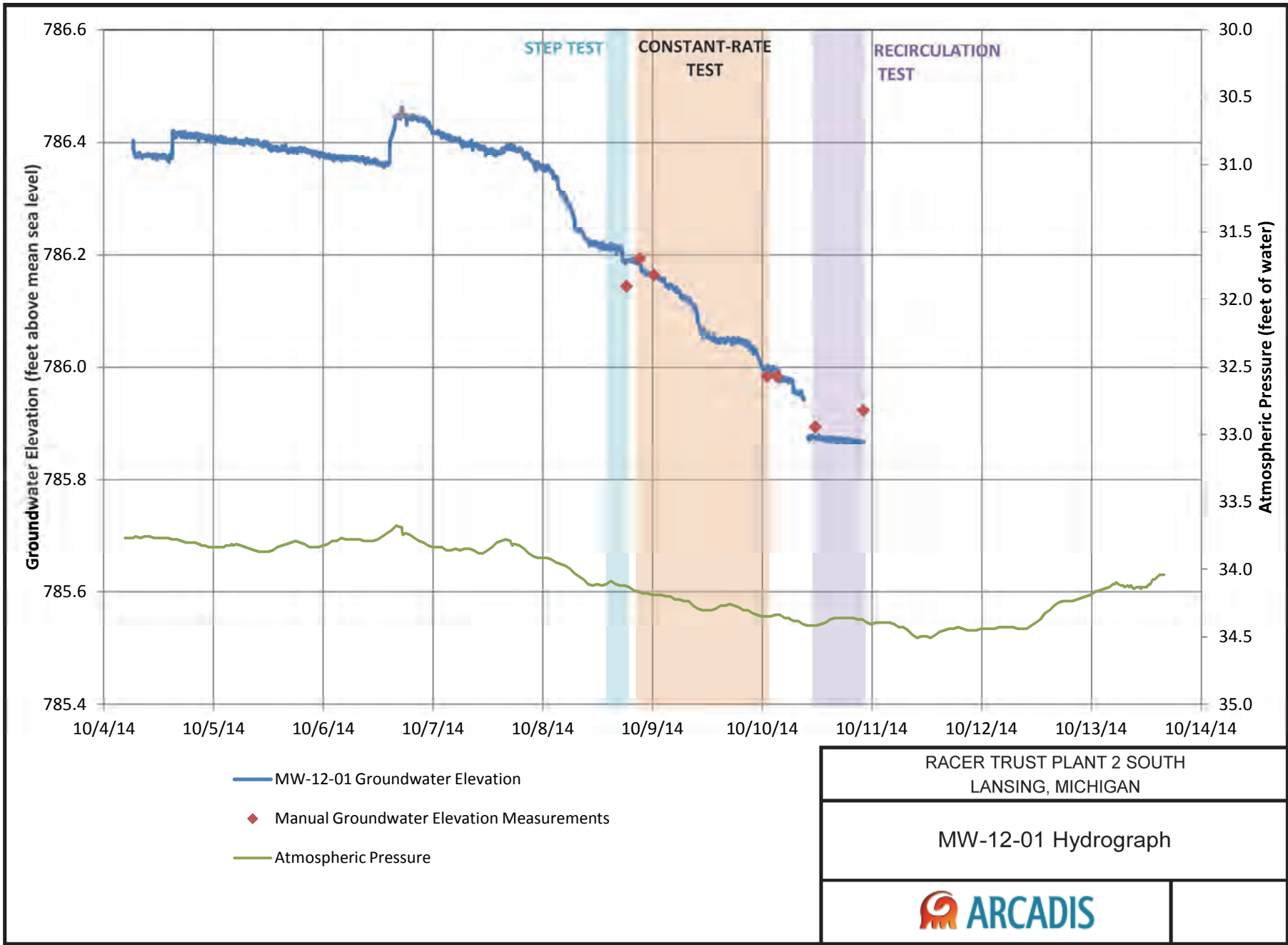
TW-14-02 Hydrograph

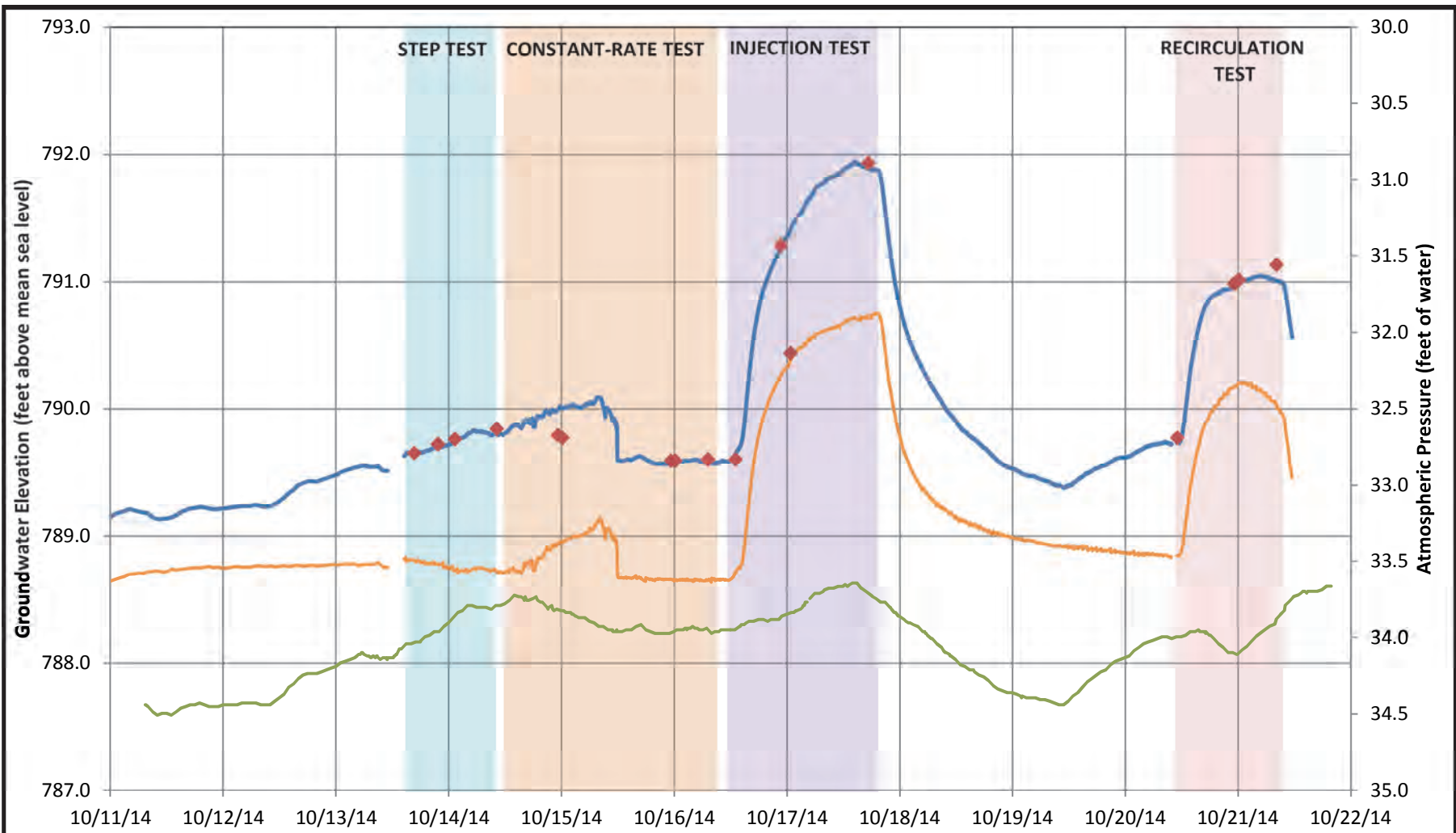




- TW-14-01 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=0.95), offset -1 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 2 SOUTH LANSING, MICHIGAN	
TW-14-01 Hydrograph	
	



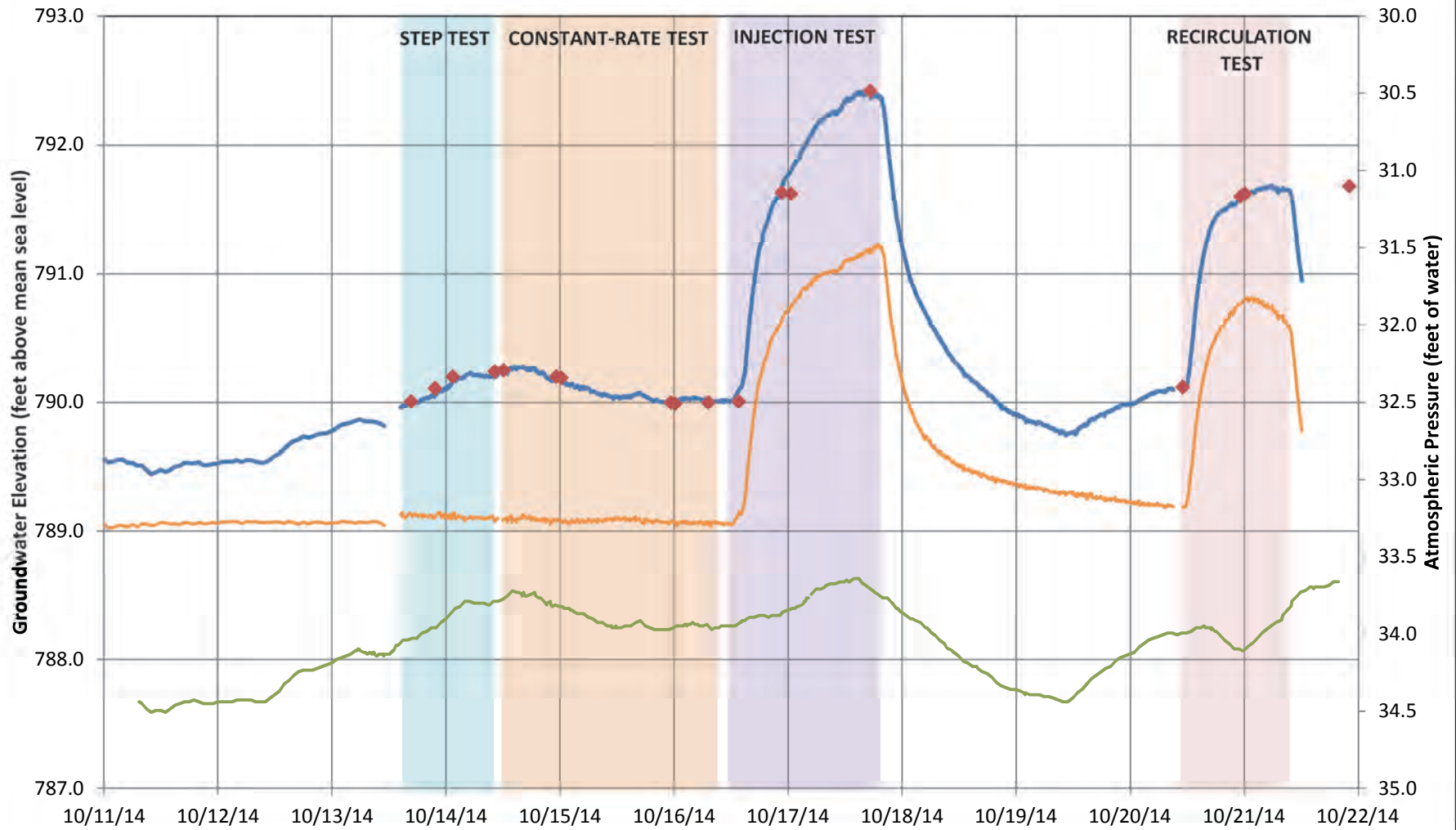


- TW-14-09 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=0.95), offset -0.5 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 3  
LANSING, MICHIGAN

TW-14-09 Hydrograph



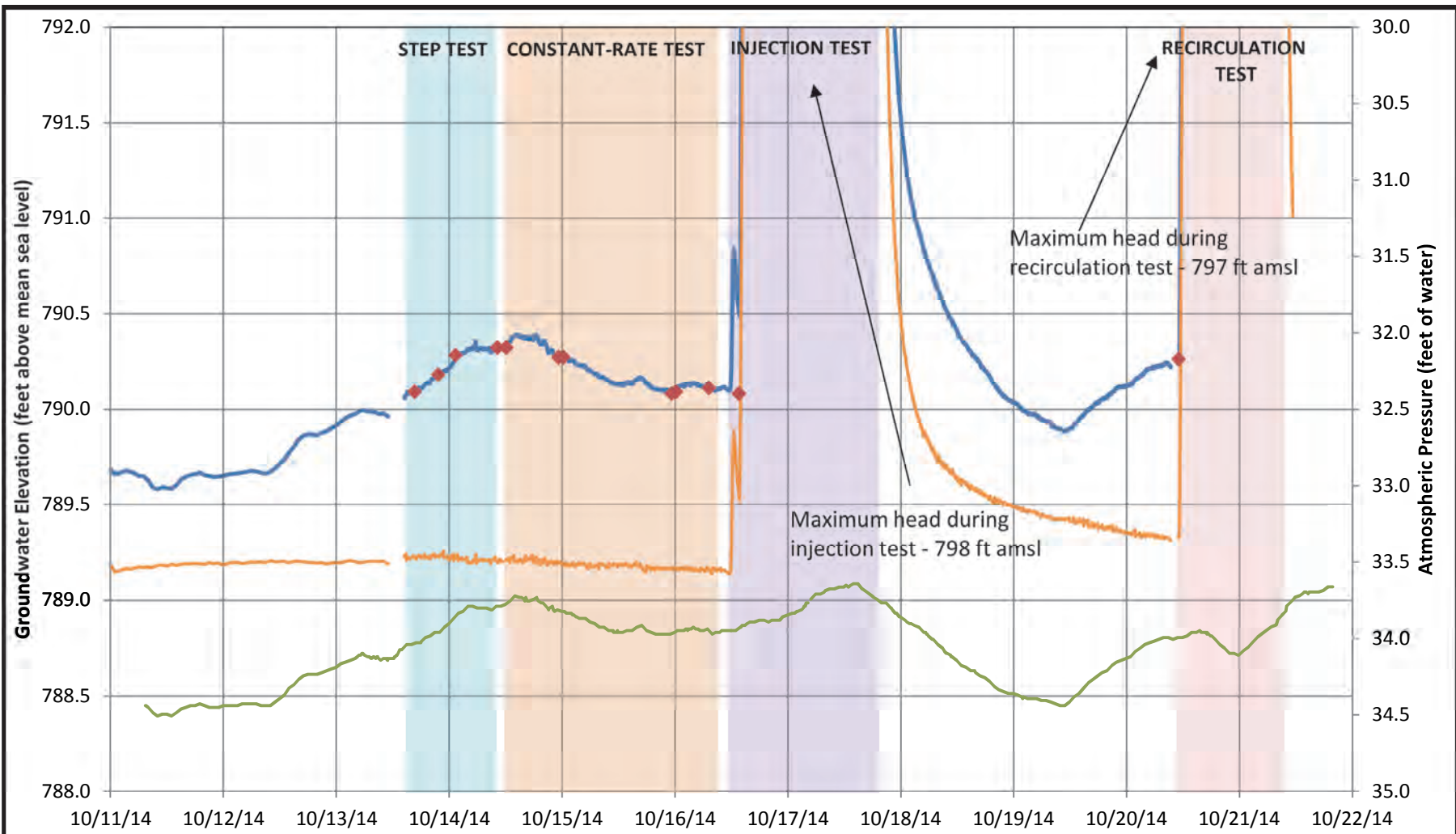


- TW-14-06 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.5 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 3  
LANSING, MICHIGAN

TW-14-06 Hydrograph



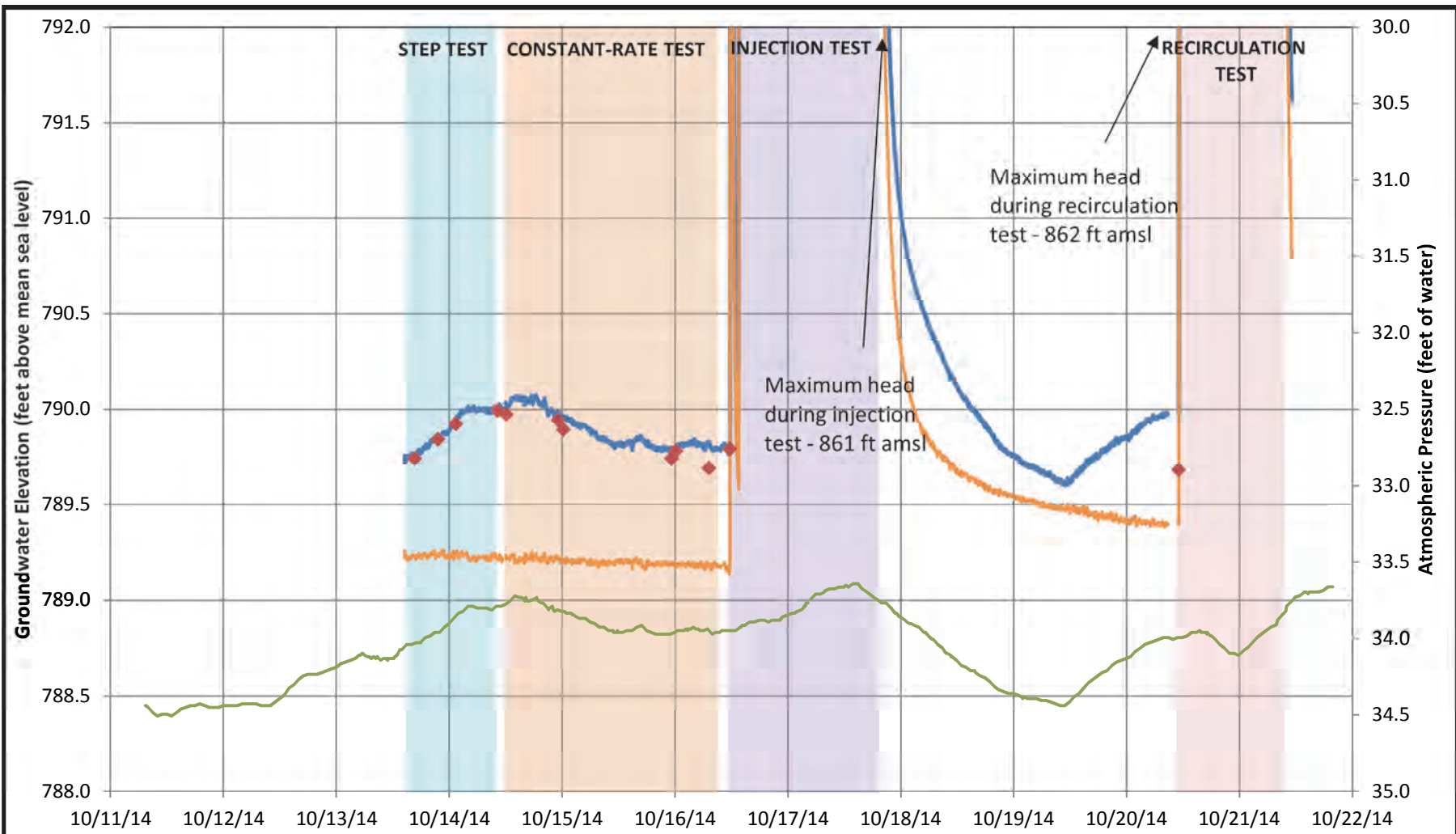


- TW-14-08 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.5 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 3  
LANSING, MICHIGAN

TW-14-08 Hydrograph



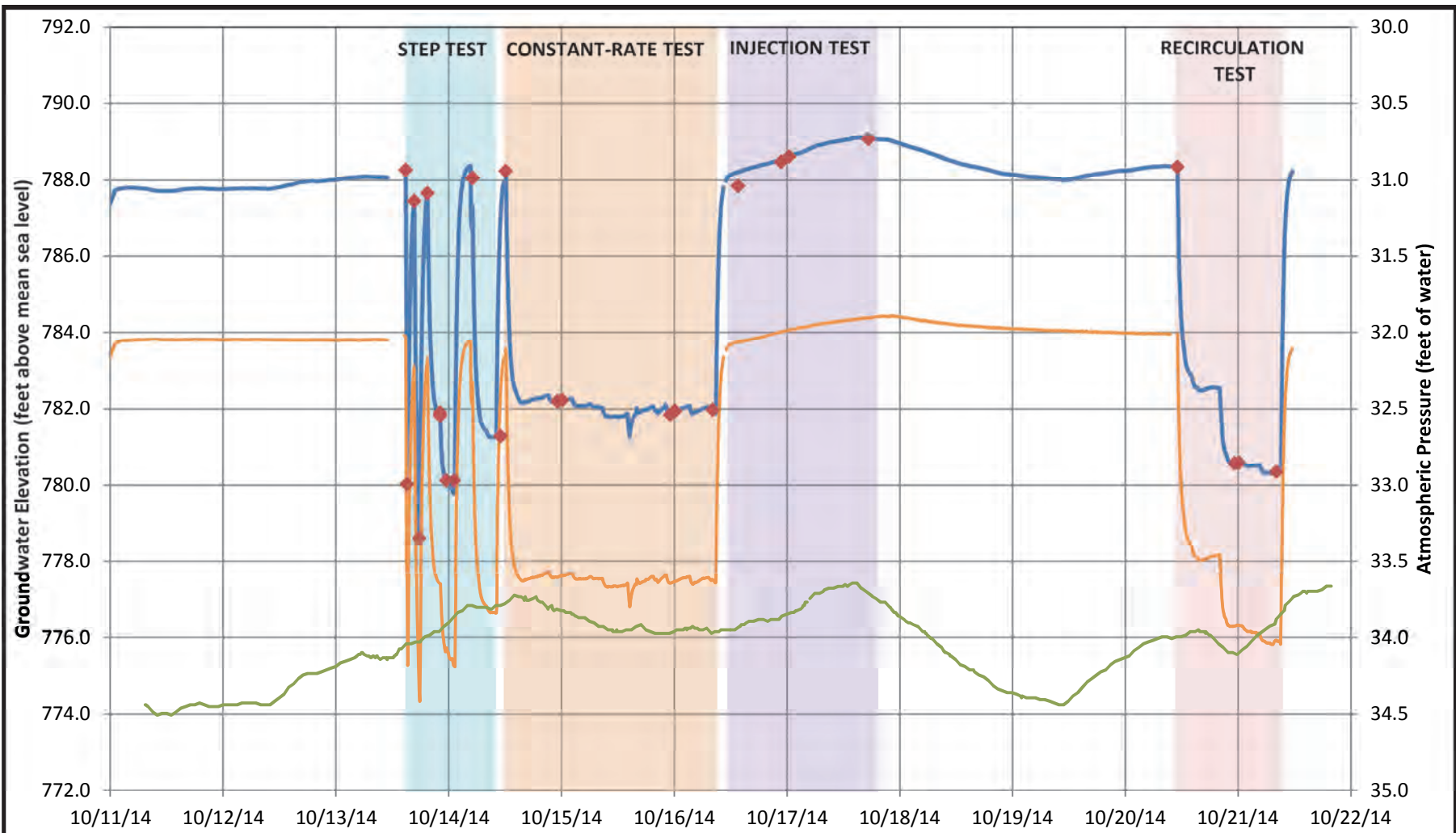


- TW-14-07 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.5 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure


RACER TRUST PLANT 3  
LANSING, MICHIGAN

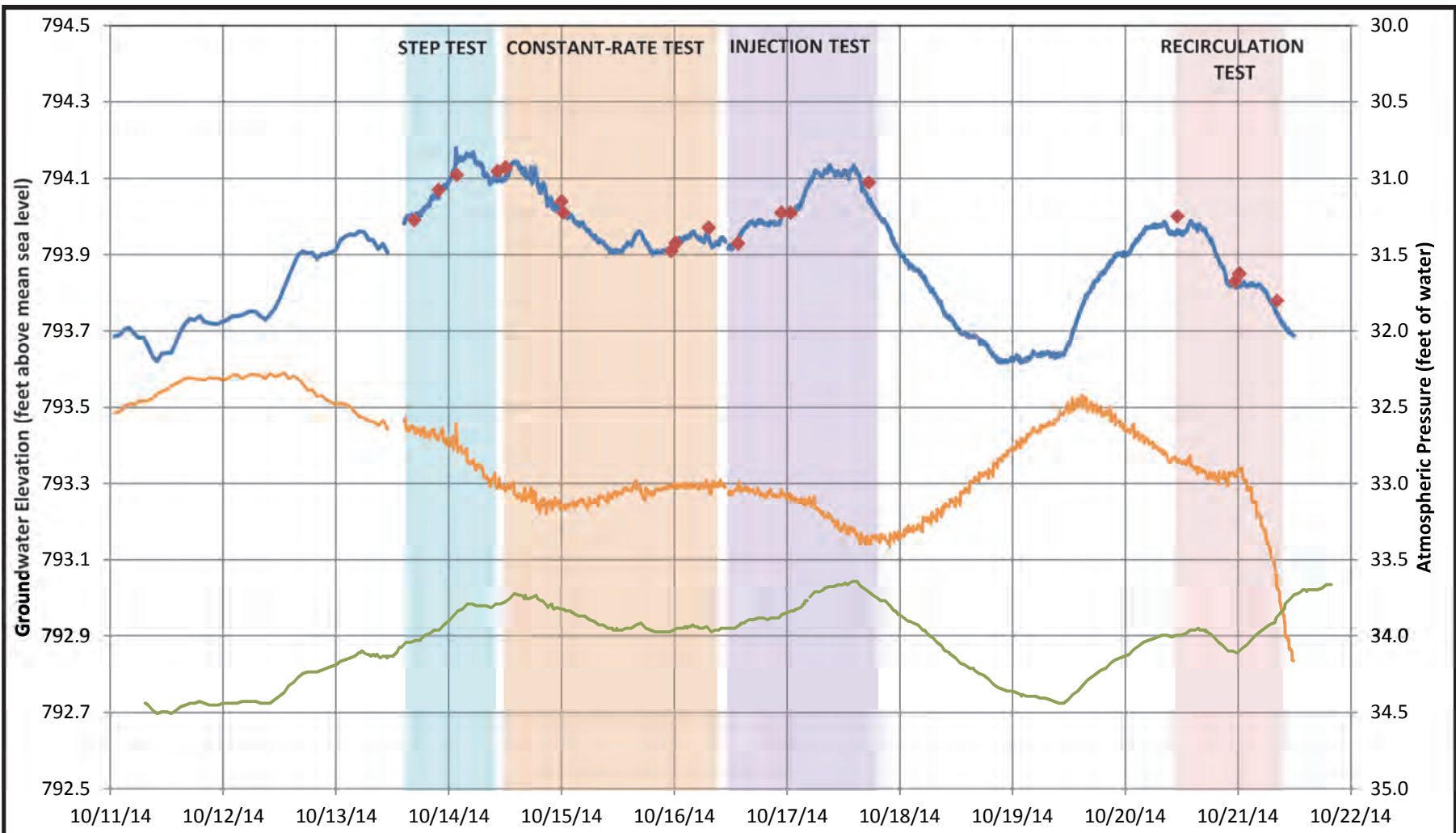
TW-14-07 Hydrograph






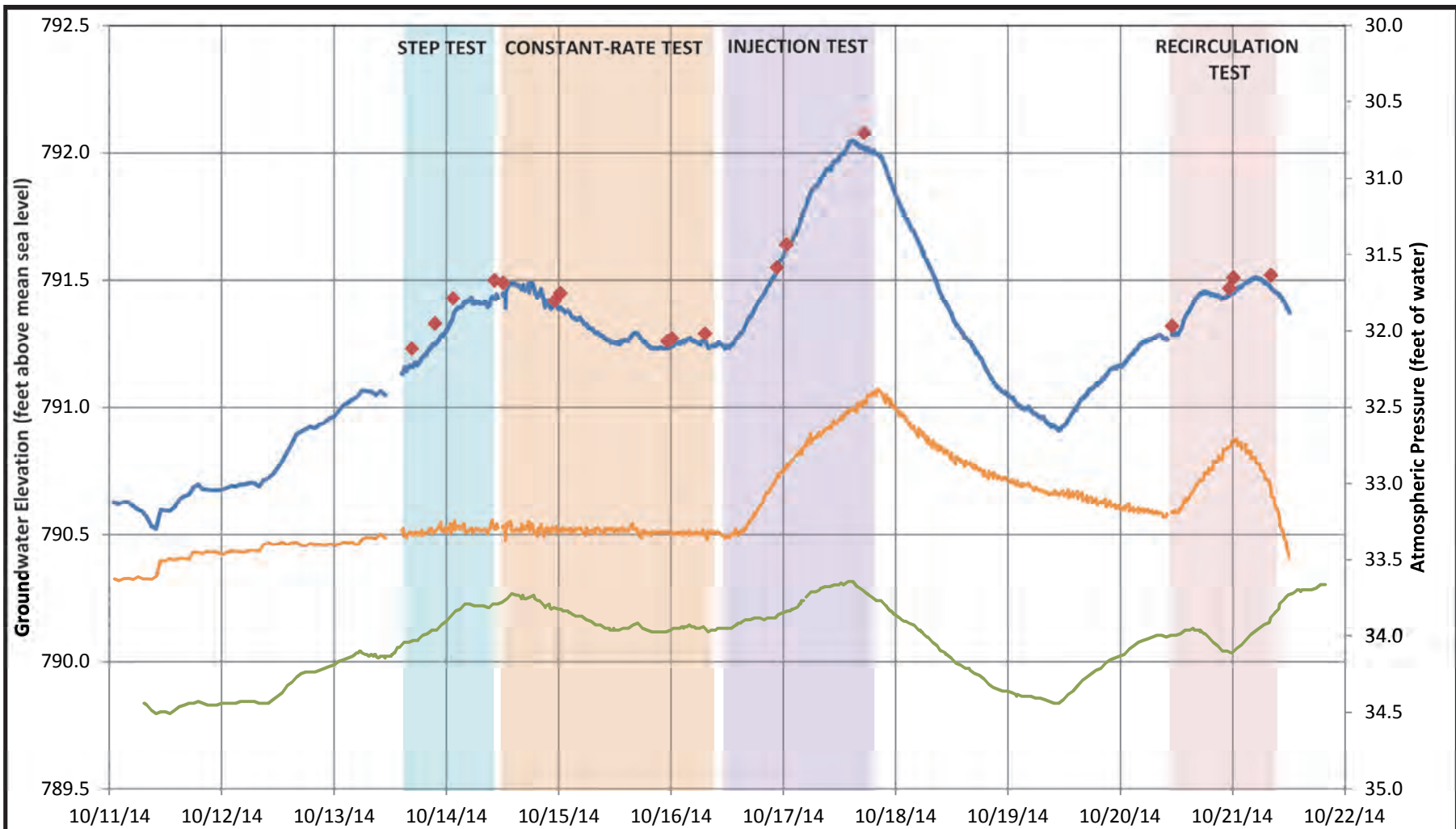
- PW-14-03 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -4 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 3 LANSING, MICHIGAN	
PW-14-03 Hydrograph	
	



- MW-13-29 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.2 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 3 LANSING, MICHIGAN	
MW-13-29 Hydrograph	
	

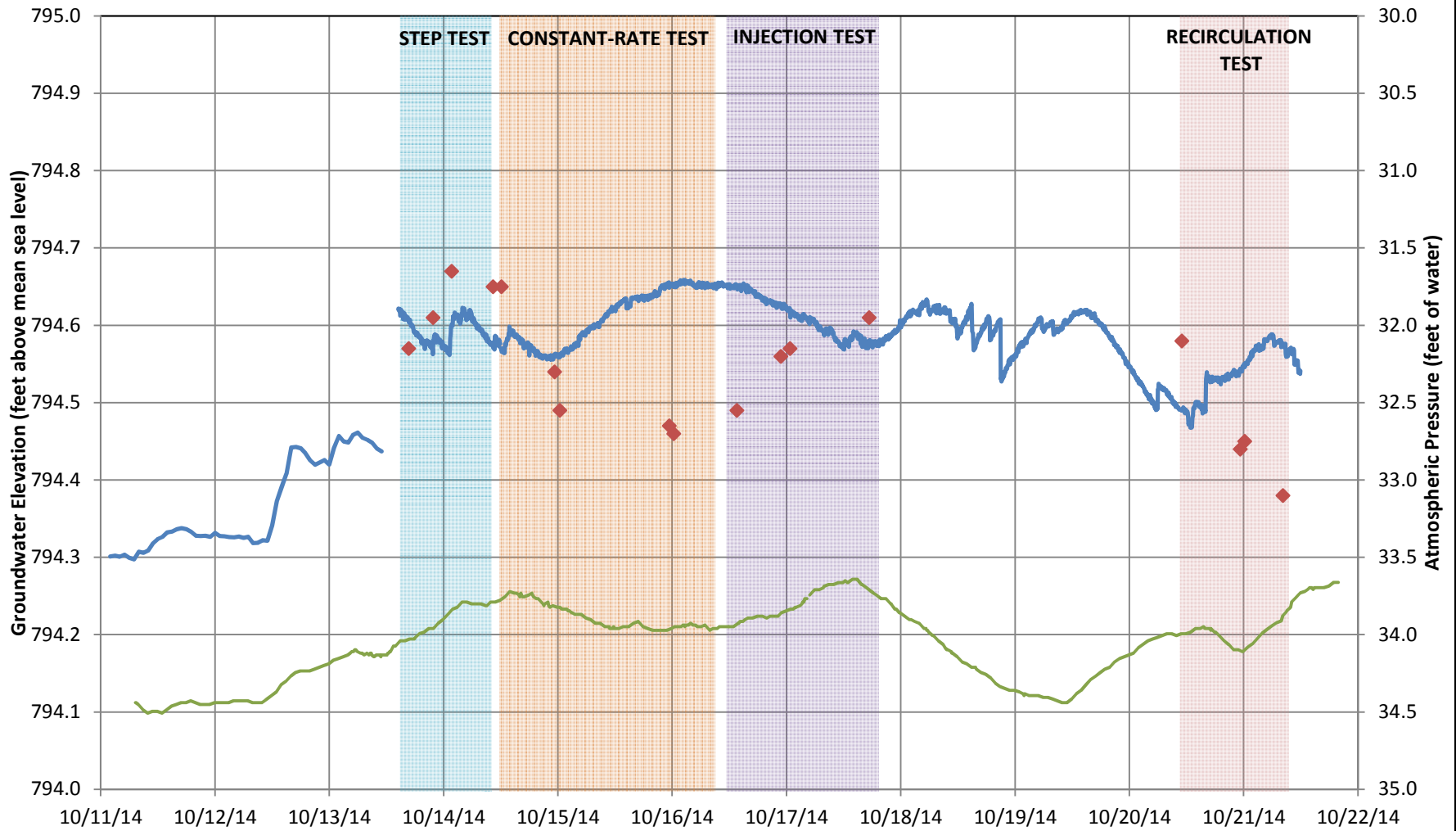


- MW-13-28 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.3 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 3  
LANSING, MICHIGAN

MW-13-28 Hydrograph



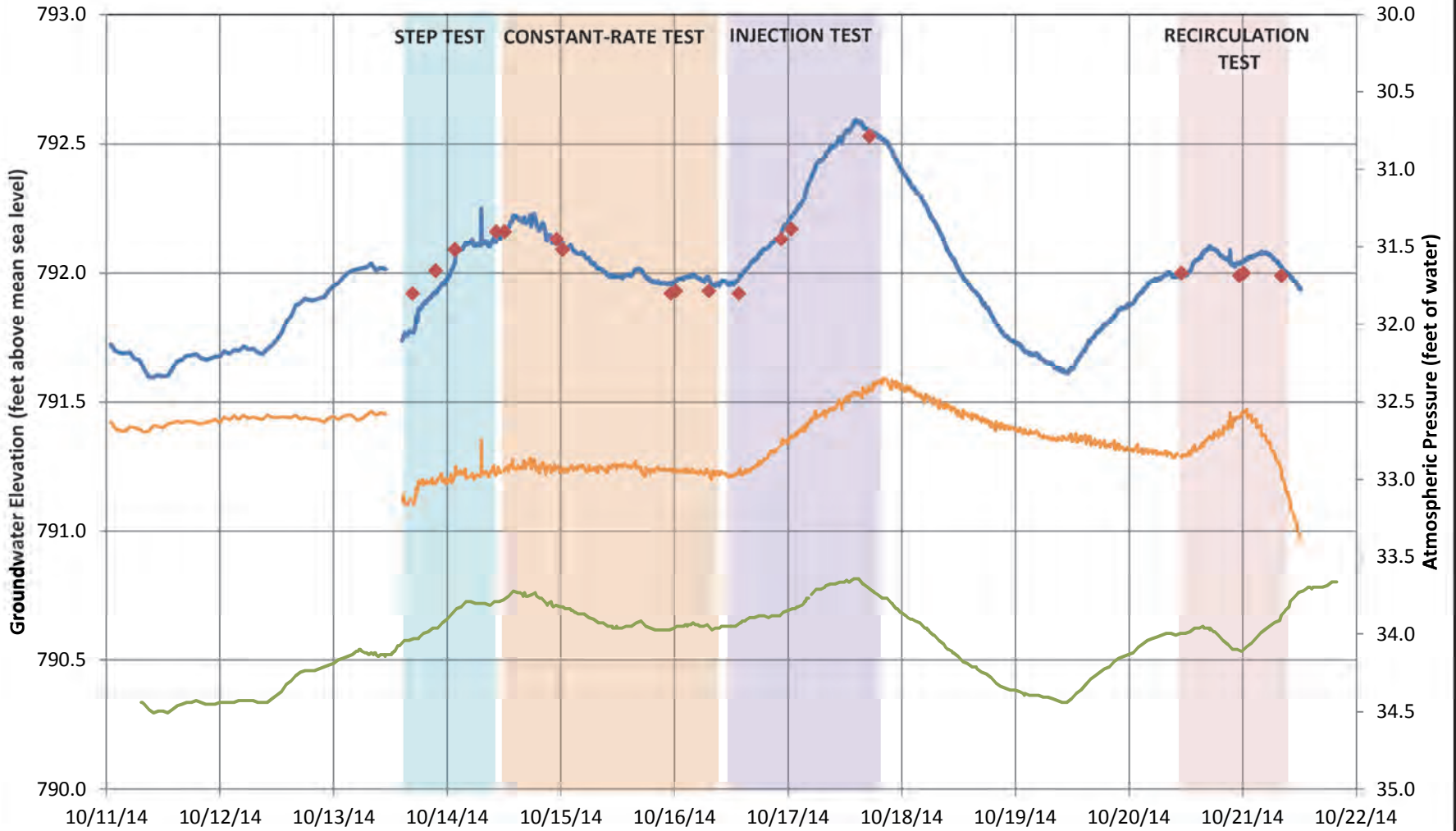


- MW-13-25 Groundwater Elevation
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure


RACER TRUST PLANT 3  
LANSING, MICHIGAN

MW-13-25 Hydrograph





- MW-13-22 Groundwater Elevation
- Groundwater Elevation with Barometric Correction (BE=1), offset -0.3 feet
- ◆ Manual Groundwater Elevation Measurements
- Atmospheric Pressure

RACER TRUST PLANT 3 LANSING, MICHIGAN	
MW-13-22 Hydrograph	
	



## **Appendix C**

Hydraulic Testing Field Activities  
Summary

## Appendix C – Hydraulic Testing Activities Summary

The following provides additional detail regarding the specific hydraulic testing activities completed at each test area.

### 1. Plant 3

Plant 3 area monitoring and testing were performed between October 11 and October 21, 2014. Testing at Plant 3 was conducted using extraction well PW-14-03, injection well TW-14-07, and seven observation wells.

#### 1.1 Extraction Testing

Pumping at PW-14-03 began on October 13 and continued through October 16, 2014. The first 24 hours of extraction included several distinct pump on/off periods of short duration. A 45-hour relatively constant-rate pumping period was initiated on October 14 at 12:07, with a rate of 0.3 gallons per minute (gpm) sustained at the pumping well. Drawdown at PW-14-03 during this test reached 6.9 feet, for a specific capacity of 0.04 gpm/ft.

Measurable drawdown responses to pumping at PW-14-03 were not identified in water levels at nearby observation wells. Parameter estimation using time-drawdown data collected during the Plant 3 extraction test was not performed due to the absence of observation well response to pumping at this location.

#### 1.2 Injection Testing

An injection test was performed at well TW-14-07 on October 16, 2014. The total duration of the test was 30 hours, with a relatively consistent injection rate of 5 gpm. Displacement of 72.4 feet was observed at injection well TW-14-07, for an injection specific capacity of 0.07 gpm/ft.

Increase in head as a result of injection at TW-14-07 was observed at pumping well PW-14-03 and five of the seven observation wells. Measurable response was not observed at wells MW-13-25 and MW-13-29; these wells are located relatively far from the injection well (147 and 165 feet away, respectively), and are screened approximately 10 feet shallower than the injection well.

Time-displacement data were analyzed using the Theis (1935) solution and its straight-line approximation method (Cooper-Jacob 1946). Estimated transmissivity varied between 130 and 246 ft<sup>2</sup>/day, with a geometric mean hydraulic conductivity of 11.3 ft/day. With the exception of the storativity estimate for displacement at TW-14-08, storativity estimates were relatively consistent with a geometric mean of 0.0023. A summary of injection test results is presented in Table 3 of the report. AQTESOLV solution matches are presented in Appendix D.



### **1.3 Recirculation Testing**

A 22-hour recirculation test was performed on October 10, 2014 at Plant 3. The injection rate at TW-14-07 was relatively stable at 4.8 gpm. A stable extraction rate of 0.3 gpm was initially obtained at PW-14-03, then increased approximately halfway through the test to a stable rate of 0.4 gpm. Maximum displacements of 8.13 and 73.08 feet were measured at PW-14-03 and TW-14-07, respectively, for corresponding extraction and injection-specific capacities of 0.05 and 0.07 gpm/ft.

## 2. Plant 2 (North)

Plant 2 North area monitoring and testing were performed between September 26 and October 8, 2014. Testing at Plant 2 North was conducted using extraction well PW-14-02, injection well TW-13-03, and six observation wells.

### 2.1 Extraction Testing

Pumping at PW-14-02 began on September 29 and continued until October 2, 2014. As shown in Appendix B, four distinct periods of pumping were performed, with short recovery breaks between each. The initial extraction period (step test) was completed on September 28 with variable pumping rates from 0.5 to 1.7 gpm. A second pumping period began on September 30, at rates between 0.5 and 1.2 gpm, and continued for approximately 6 hours until the pump was turned off for approximately 1 hour. The third period of pumping was conducted at a relatively steady rate of 0.8 gpm for approximately 6 hours. The fourth and final period of pumping was performed following a 4-hour shutdown period, and lasted for approximately 56 hours at a relatively constant rate of 0.5 gpm. The total duration of extraction testing, from the start of the step test through the final, long-term pumping period, was 65 hours. A specific capacity of 0.11 gpm/ft was calculated for extraction at PW-14-02 based on the sustainable extraction rate of 0.5 gpm and measured displacement of 5.6 feet at this rate.

Two sections of extraction testing at Plant 2 North were selected for analysis:

- An early-time testing period, which included the second and third pumping periods described above
- A late-time testing period, which was limited to the final 56-hour pumping period, conducted at a relatively constant pumping rate

Static water levels were estimated from water-level data collected prior to the beginning of pumping at PW-14-02. Summary sheets of selected test durations, rates, and displacements are presented in Appendix E.

As shown in Appendix E, measurable drawdown responses to pumping at PW-14-02 were identified at injection well TW-14-05 and three of the six observation wells. Measurable drawdown response was not identified in water levels at wells MW-13-44 (screened in consolidated bedrock, approximately 15 feet below other wells) or at wells MW-13-42 and MW-13-45, which are located more than 200 feet away from the pumping well. Time-drawdown data for the early-time test were analyzed using the Theis (1935) solution for displacement, and late-time test data were analyzed using the Cooper-Jacob (1946) straight-line approximation of the Theis solution. Estimated transmissivity varied between 11.5 and 37.4 ft<sup>2</sup>/day for the early-time data and 24.8 and 62.1 ft<sup>2</sup>/day for the late-time data, with corresponding mean (geometric) hydraulic conductivities of 1.4 and 3.1 ft/day. A summary of extraction testing results is presented in Table 4 of the report. AQTESOLV solution matches are presented in Appendix D.

### 2.2 Injection Testing

An injection test was performed at well TW-14-03 on October 2, 2014. The total duration of the test was 39.1 hours. Injection rates as high as 10 gpm were measured at the beginning of the injection test, but rates



quickly decreased to approximately 8.5 gpm after half an hour, then continued to decrease throughout the test duration to a final rate of 6.1 gpm. Maximum displacement at the injection well during the test was 66.85 feet; for a representative rate of 6.5 gpm, the injection specific capacity for TW-14-03 was 0.10 gpm/ft.

Increase in head as a result of injection at TW-14-03 was observed at pumping well PW-14-02 and three observation wells. Measurable response was not observed at wells MW-13-44, MW-13-45, and MW-13-42 due to distance from injection well (MW-13-45 and MW-13-42) or significantly different screen interval (MW-13-44, installed deeper in consolidated bedrock).

Time-displacement data were analyzed using either the Cooper-Jacob (1946) straight-line approximation of the Theis solution. To account for the slow decrease of injection rate during the test, three representative rates were used for AQTESOLV analysis: 7 gpm (0 to 1,300 minutes), 6.5 gpm (1,300 to 1,900 minutes), and 6.3 gpm (1,900 to 2,352 minutes). Estimated transmissivity varied between 28.6 and 48 ft<sup>2</sup>/day, with a geometric mean hydraulic conductivity of 2.2 ft/day. The geometric mean of storativity estimates was  $1.3 \times 10^{-4}$ .

### **2.3 Recirculation Testing**

A 45-hour recirculation test was performed starting on October 6, 2014 at Plant 2 North using extraction well PW-14-02 and injection well TW-14-03. Recirculation testing was performed in two stages: during the first 24 hours of the test, extraction and injection rates were limited to approximately 0.5 gpm at both wells; then rates were increased to the maximum allowed by well constraints, 6.5 gpm at the injection well and 1.5 gpm at the extraction well. Transducer data for the second portion of the recirculation test were lost; however, manual measurements indicate maximum displacements of 5.25 feet and 58.98 feet at PW-14-02 and TW-14-03, respectively, with corresponding specific capacities of 0.25 gpm/ft and 0.11 gpm/ft.

### 3. Plant 2 (South)

Plant 2 South area monitoring and testing were performed between October 4 and October 13, 2014. Testing at Plant 2 South was conducted using extraction well PW-14-01, injection well TW-13-01, and two observation wells. Testing at Plant 2 South consisted of extraction testing and a recirculation test; an injection test was not performed at this location.

#### 3.1 Extraction Testing

Pumping at PW-14-01 began on October 8 and continued until October 10, 2014. Three distinct pumping periods were conducted; the first two pumping periods (step test) lasted several hours, with breaks of a few hours following each pumping period. The third pumping period lasted approximately 35 hours, with a relatively steady pumping rate of 0.1 gpm recorded during this time. A specific capacity of 0.015 was calculated for extraction well PW-14-01 based on the sustainable extraction rate of 0.1 gpm and measured displacement of 6.62 feet at this rate.

Two periods of extraction at Plant 2 South were selected for analysis. The first dataset included the full duration of extraction, with three discrete pumping periods, and the second dataset was limited to the 35-hour constant-rate testing period (late time). Static water levels were generalized from water-level data collected prior to the beginning of pumping at PW-14-01. Summary sheets of selected test durations, rates, and displacements are presented in Appendix E.

As shown in Appendix E, measurable drawdown responses to pumping at PW-14-01 were identified at injection well TW-14-03 and observation well TW-14-02, located 15 feet from PW-14-01. Measurable drawdown response was not identified in water levels at well MW-12-01, presumably due to the distance of 399 feet from the pumping well. Time-drawdown data for the full duration of extraction were analyzed using the Dougherty-Babu (1984) solution, which accounts for the effects of wellbore storage, and late-time test data were analyzed using the Cooper-Jacob (1946) straight-line approximation of the Theis solution. Estimated transmissivities at wells TW-14-02 and TW-14-01 were 15.3 and 8.9 ft<sup>2</sup>/day for the full-duration analysis, and 20.0 and 10.5 ft<sup>2</sup>/day for the late-time data, with corresponding mean (geometric) hydraulic conductivities of 0.8 and 1.0 ft/day. Estimated storativities for both analyses were extremely consistent, with geometric means of 0.003 and 0.002 for the full-duration and late-time analyses, respectively. A summary of extraction test results is presented in Table 2 of the report. AQTESOLV solution matches are presented in Appendix D.

#### 3.2 Recirculation Testing

A 10-hour recirculation test was performed on October 10, 2014 at Plant 2 South, using extraction well PW-14-01 and injection well TW-14-01. Rates of injection and extraction during this time were relatively stable, at 0.8 and 0.1 gpm, respectively. Maximum displacements of 4.59 feet at PW-14-01 and 64.93 feet at TW-14-01 were measured, with corresponding extraction and injection specific capacities of 0.022 and 0.012 gpm/ft.



#### 4. References

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New Jersey Department of Environmental Protection (NJDEP). 2013. Development of Site-Specific Impact to Ground Water Soil Remediation Standards Using the Synthetic Precipitation Leaching Procedure. Version 3.0. November.

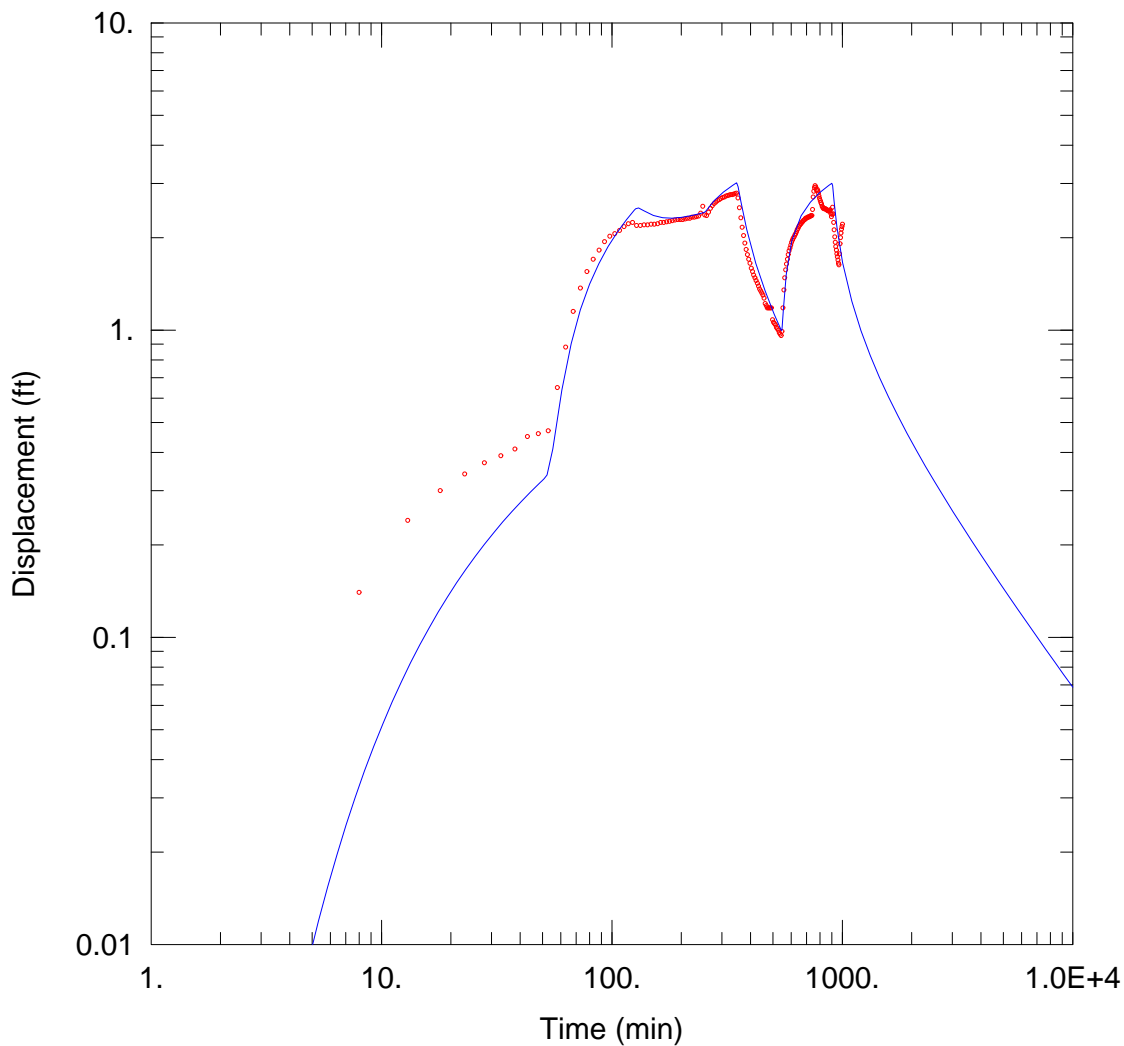
Theis, C.V. 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

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## **Appendix D**

AQTESOLV Analysis Summary



PLANT 2 NORTH PW-14-02 CONSTANT-RATE TEST (EARLY TIME)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-02  
 Test Date: 9/29/2014

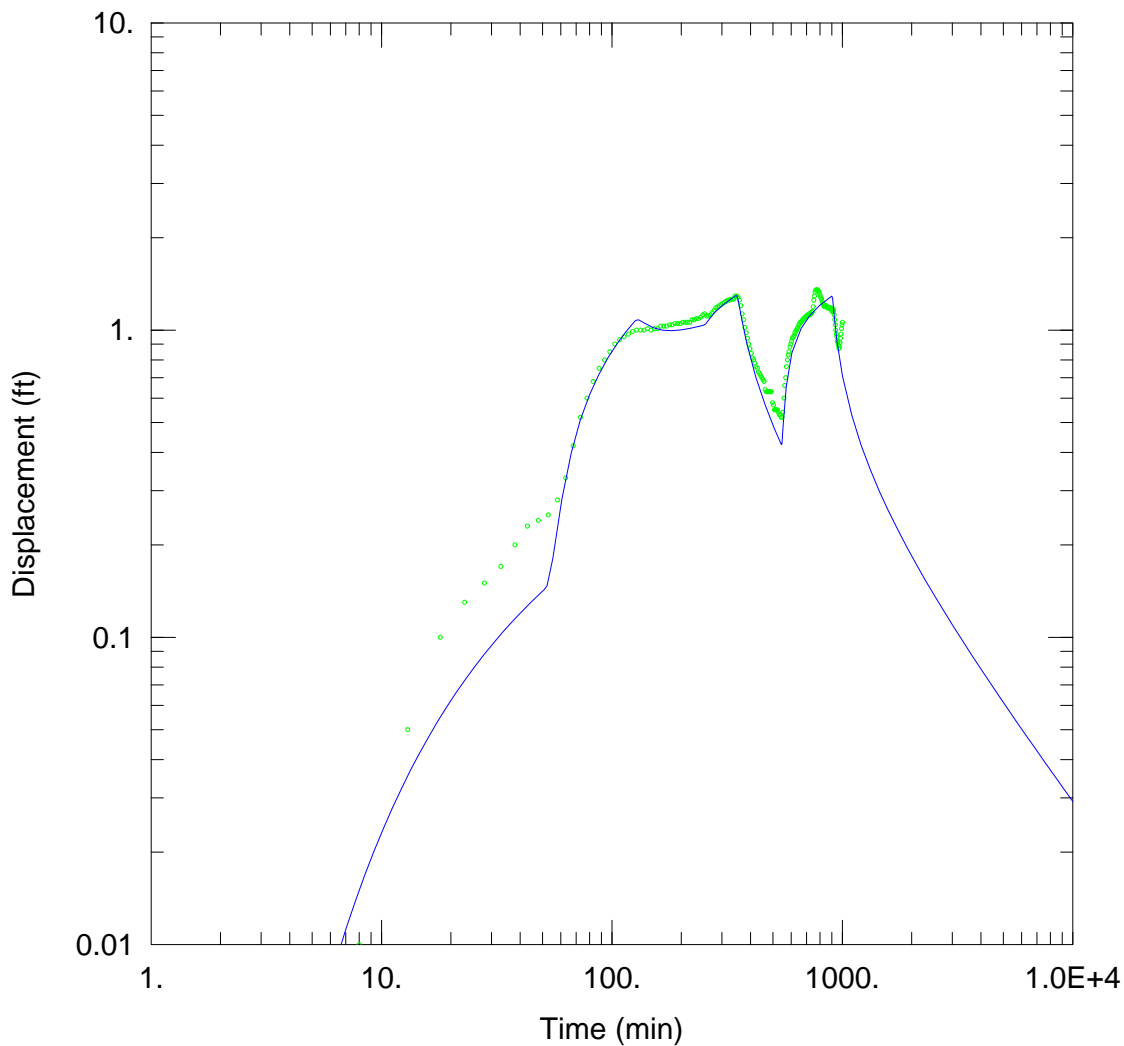
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
PW-14-02	446	503	• MW-13-43	441	533.9

SOLUTION

Aquifer Model: Confined  
 $T = 15.9 \text{ ft}^2/\text{day}$   
 $Kz/Kr = 1.$

Solution Method: Theis  
 $S = 0.00051$   
 $b = 15. \text{ ft}$



PLANT 2 NORTH PW-14-02 CONSTANT-RATE TEST (EARLY TIME)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-02  
 Test Date: 9/29/2014

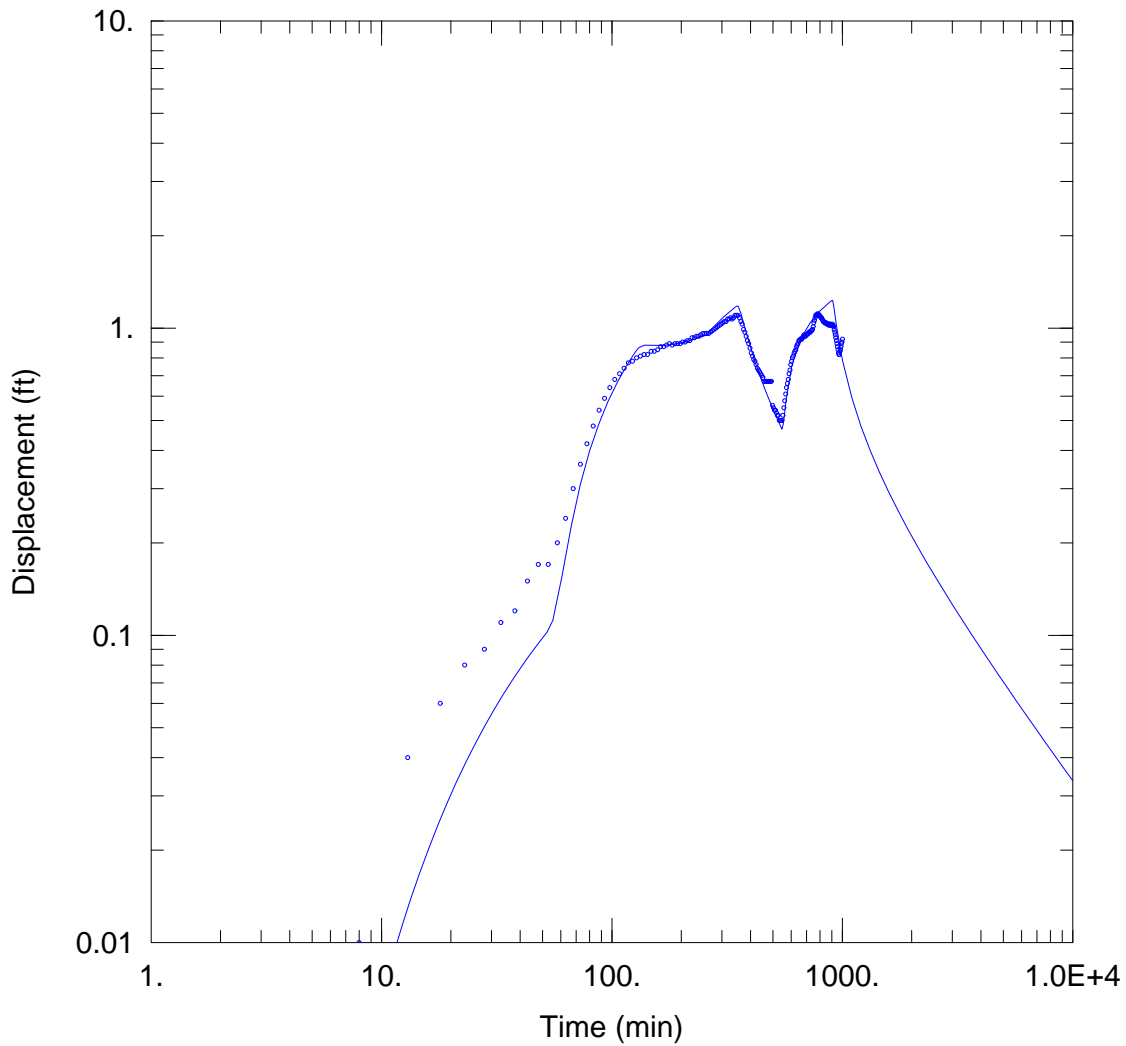
WELL DATA

<u>Pumping Wells</u>			<u>Observation Wells</u>		
<u>Well Name</u>	<u>X (ft)</u>	<u>Y (ft)</u>	<u>Well Name</u>	<u>X (ft)</u>	<u>Y (ft)</u>
PW-14-02	446	503	• TW-14-03	436.6	554.8

SOLUTION

Aquifer Model: Confined  
 $T = 37.4 \text{ ft}^2/\text{day}$   
 $Kz/Kr = 1.$

Solution Method: Theis  
 $S = 0.00041$   
 $b = 15. \text{ ft}$



PLANT 2 NORTH PW-14-02 CONSTANT-RATE TEST (EARLY TIME)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-02  
 Test Date: 9/29/2014

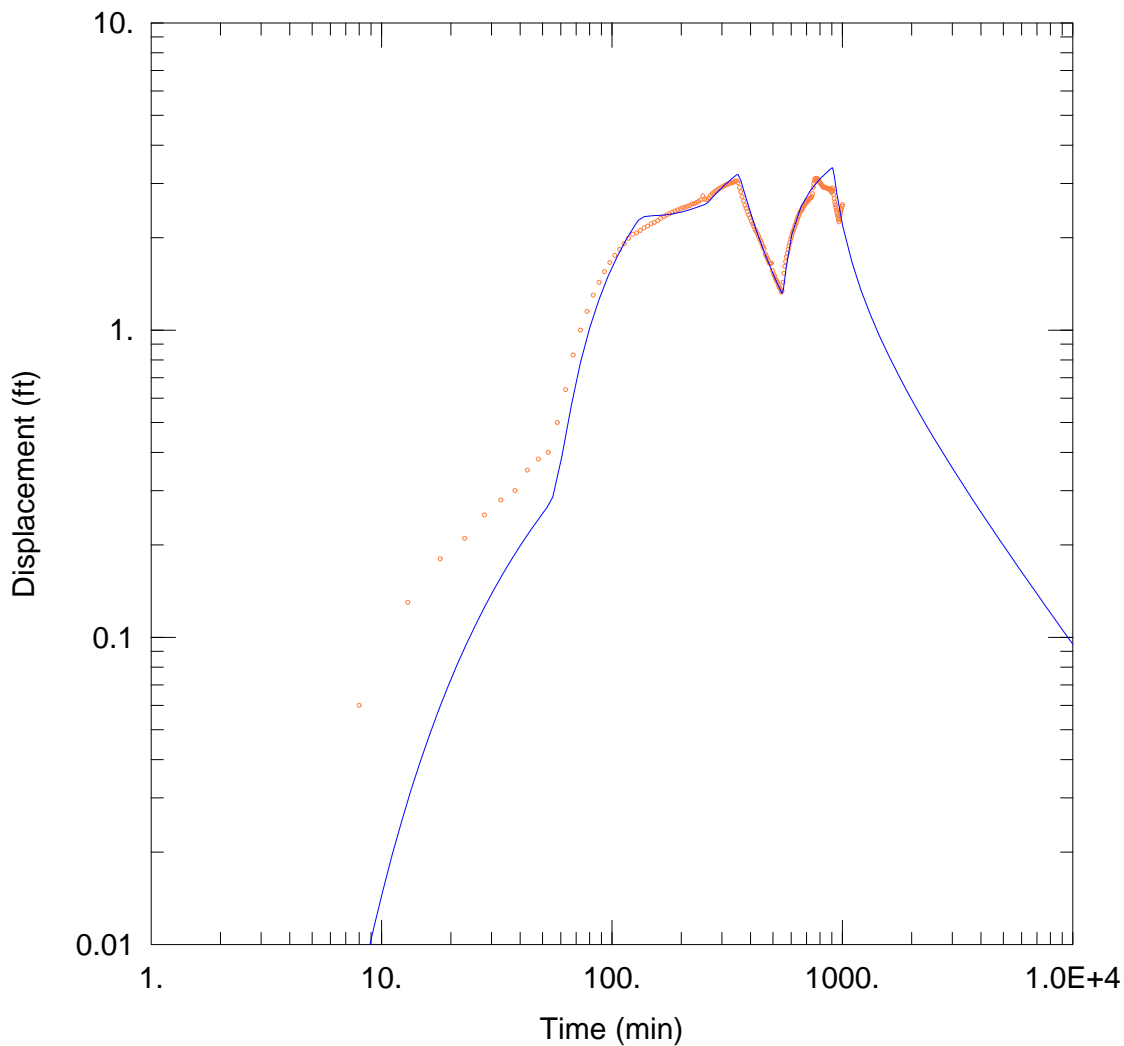
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
PW-14-02	446	503	• TW-14-04	408.5	524.9

SOLUTION

Aquifer Model: Confined  
 $T = 32.5 \text{ ft}^2/\text{day}$   
 $Kz/Kr = 1.$

Solution Method: Theis  
 $S = 0.00097$   
 $b = 15. \text{ ft}$



PLANT 2 NORTH PW-14-02 CONSTANT-RATE TEST (EARLY TIME)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-02  
 Test Date: 9/29/2014

WELL DATA

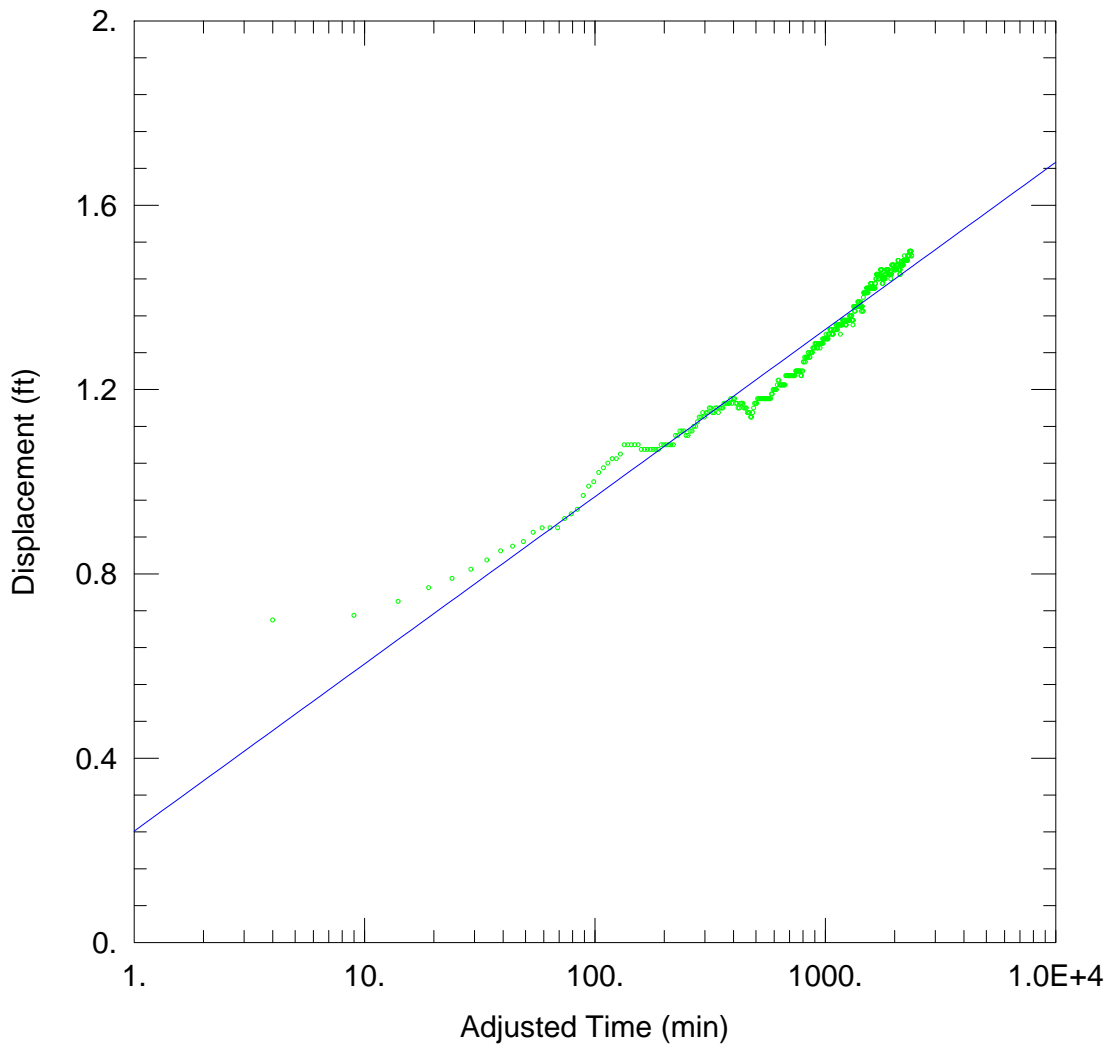
Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
PW-14-02	446	503	• TW-14-05	442.8	518.9

SOLUTION

Aquifer Model: Confined  
 $T = 11.5 \text{ ft}^2/\text{day}$   
 $Kz/Kr = 1.$

Solution Method: Theis  
 $S = 0.0027$   
 $b = 15. \text{ ft}$





PLANT 2 NORTH PW-14-02 CONSTANT-RATE TEST (LATE TIME)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-02  
 Test Date: 9/30/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PW-14-02	446	503

Observation Wells

Well Name	X (ft)	Y (ft)
• TW-14-03	436.6	554.8

SOLUTION

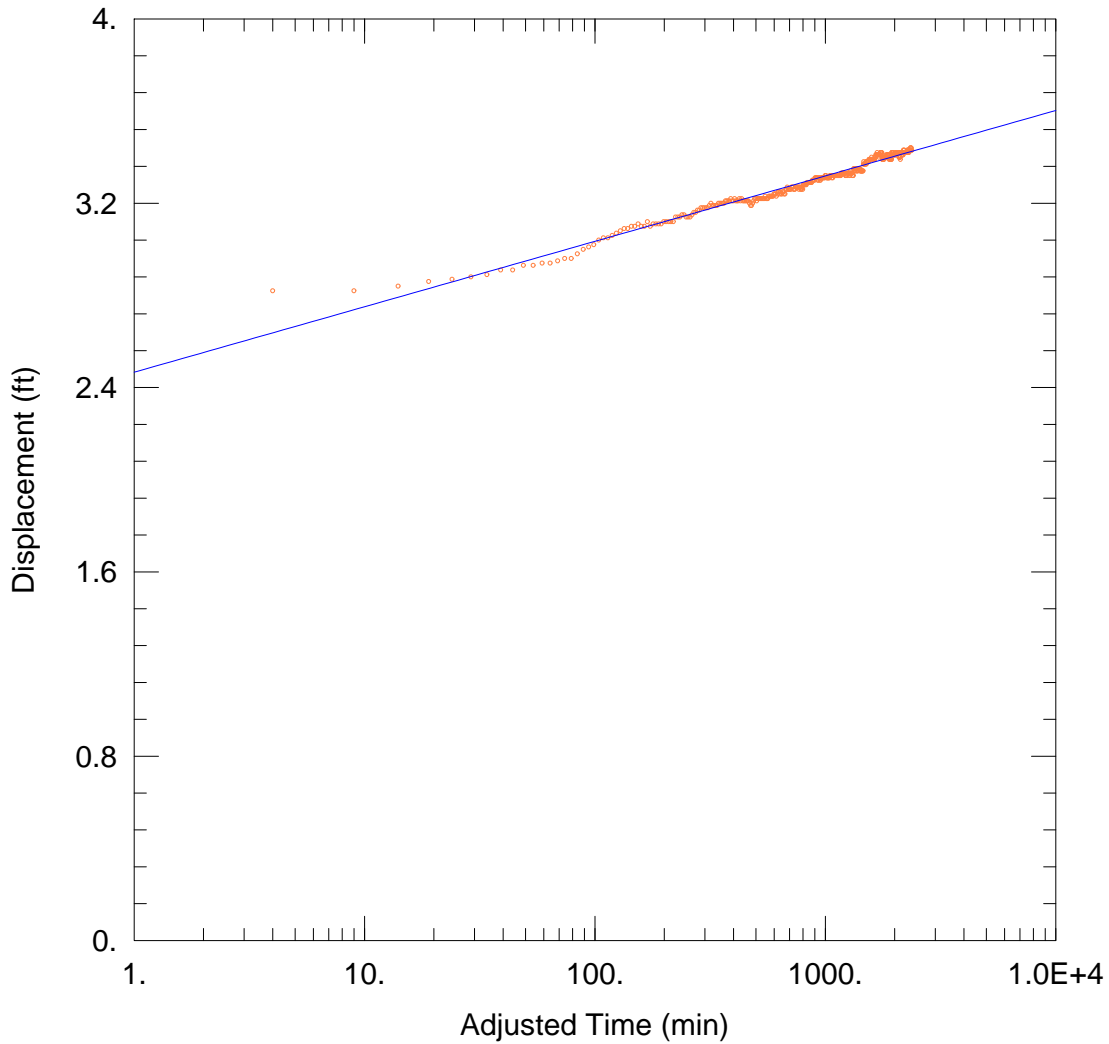
Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 48.6 ft<sup>2</sup>/day

S = 5.9E-6





PLANT 2 NORTH PW-14-02 CONSTANT-RATE TEST (LATE TIME)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-02  
 Test Date: 9/30/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PW-14-02	446	503

Observation Wells

Well Name	X (ft)	Y (ft)
• TW-14-05	442.8	518.9

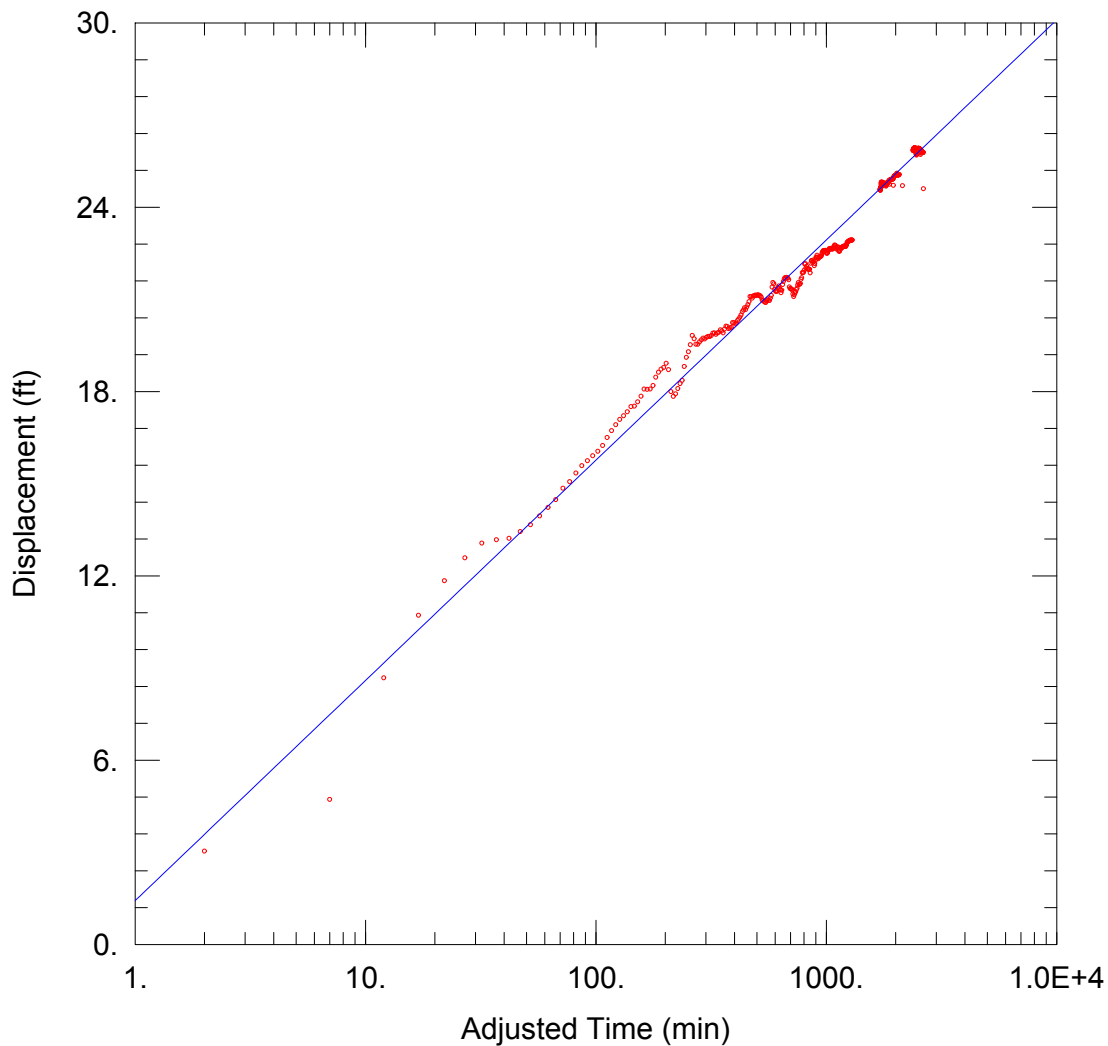
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 62.1 ft<sup>2</sup>/day

S = 7.6E-13



PLANT 2 NORTH TW-14-03 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-03  
 Test Date: 10/2/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-14-03	436.6	554.8

Observation Wells

Well Name	X (ft)	Y (ft)
• MW-13-43	441	533.9

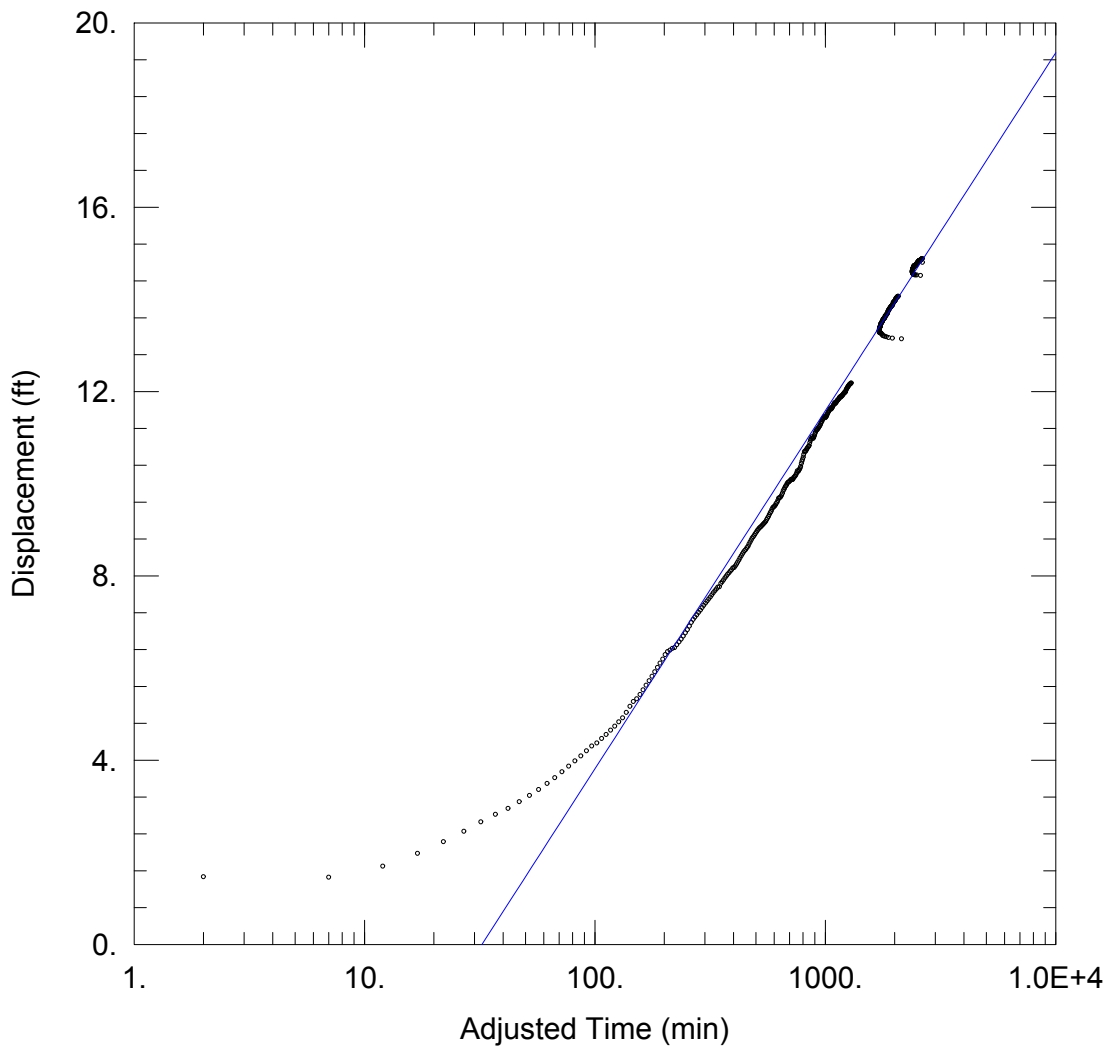
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 31. ft<sup>2</sup>/day

S = 6.7E-5



PLANT 2 NORTH TW-14-03 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-03  
 Test Date: 10/2/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-14-03	436.6	554.8

Observation Wells

Well Name	X (ft)	Y (ft)
• <u>PW-14-02</u>	446	503

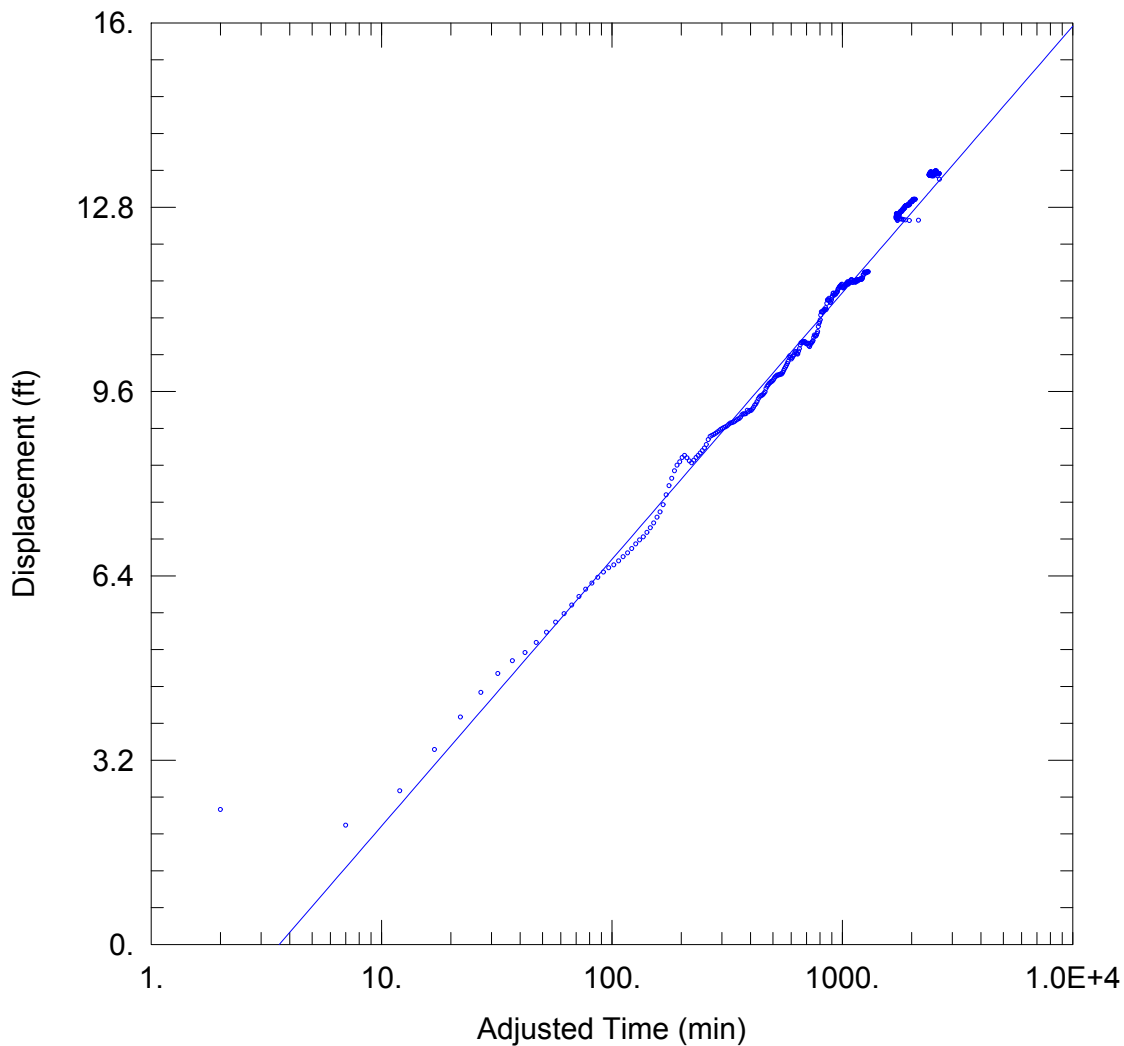
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 28.6 ft<sup>2</sup>/day

S = 0.00052



PLANT 2 NORTH TW-14-03 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-03  
 Test Date: 10/2/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-14-03	436.6	554.8

Observation Wells

Well Name	X (ft)	Y (ft)
• TW-14-04	408.5	524.9

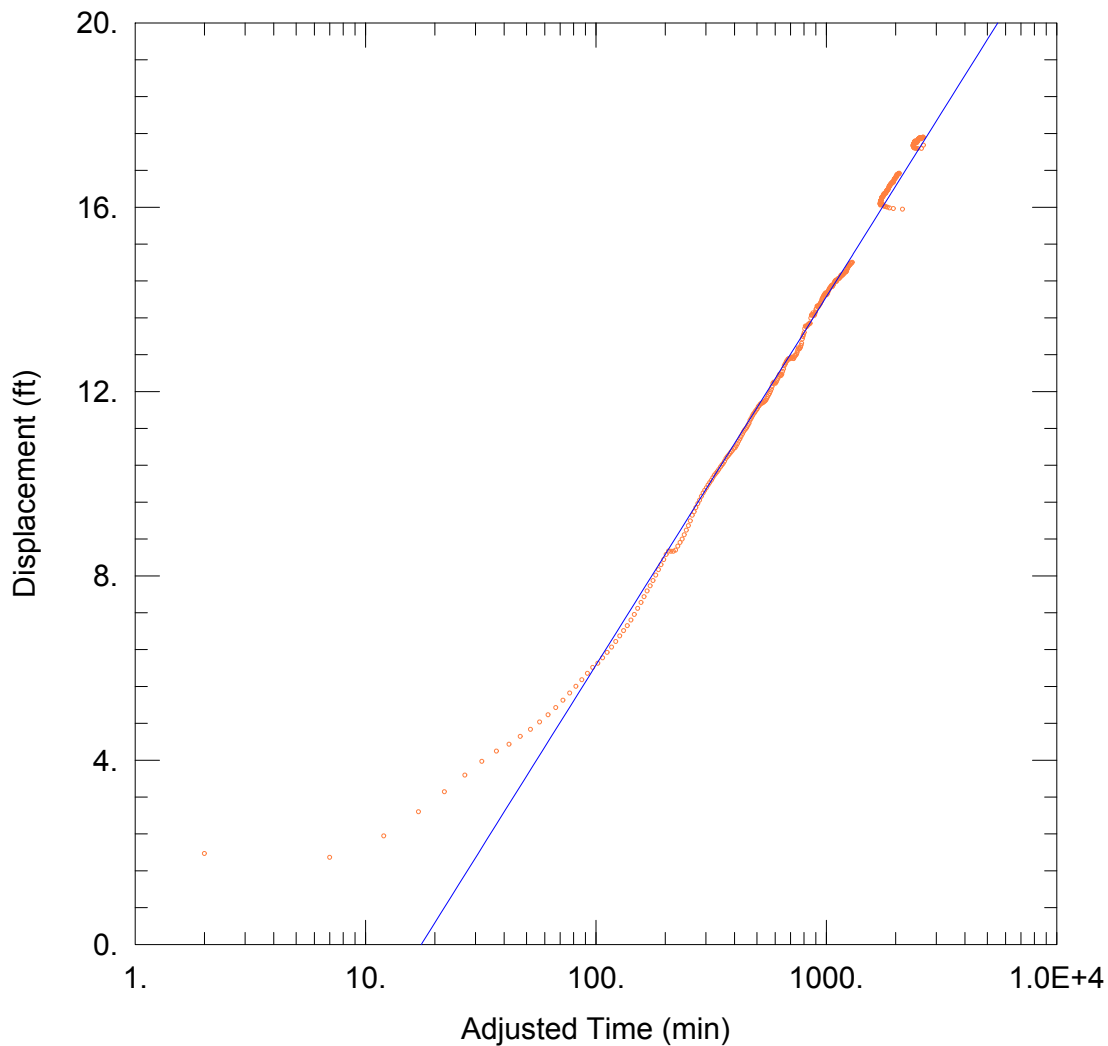
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 48. ft<sup>2</sup>/day

S = 0.00016



PLANT 2 NORTH TW-14-03 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-03  
 Test Date: 10/2/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
TW-14-03	436.6	554.8

Observation Wells

Well Name	X (ft)	Y (ft)
• TW-14-05	442.8	518.9

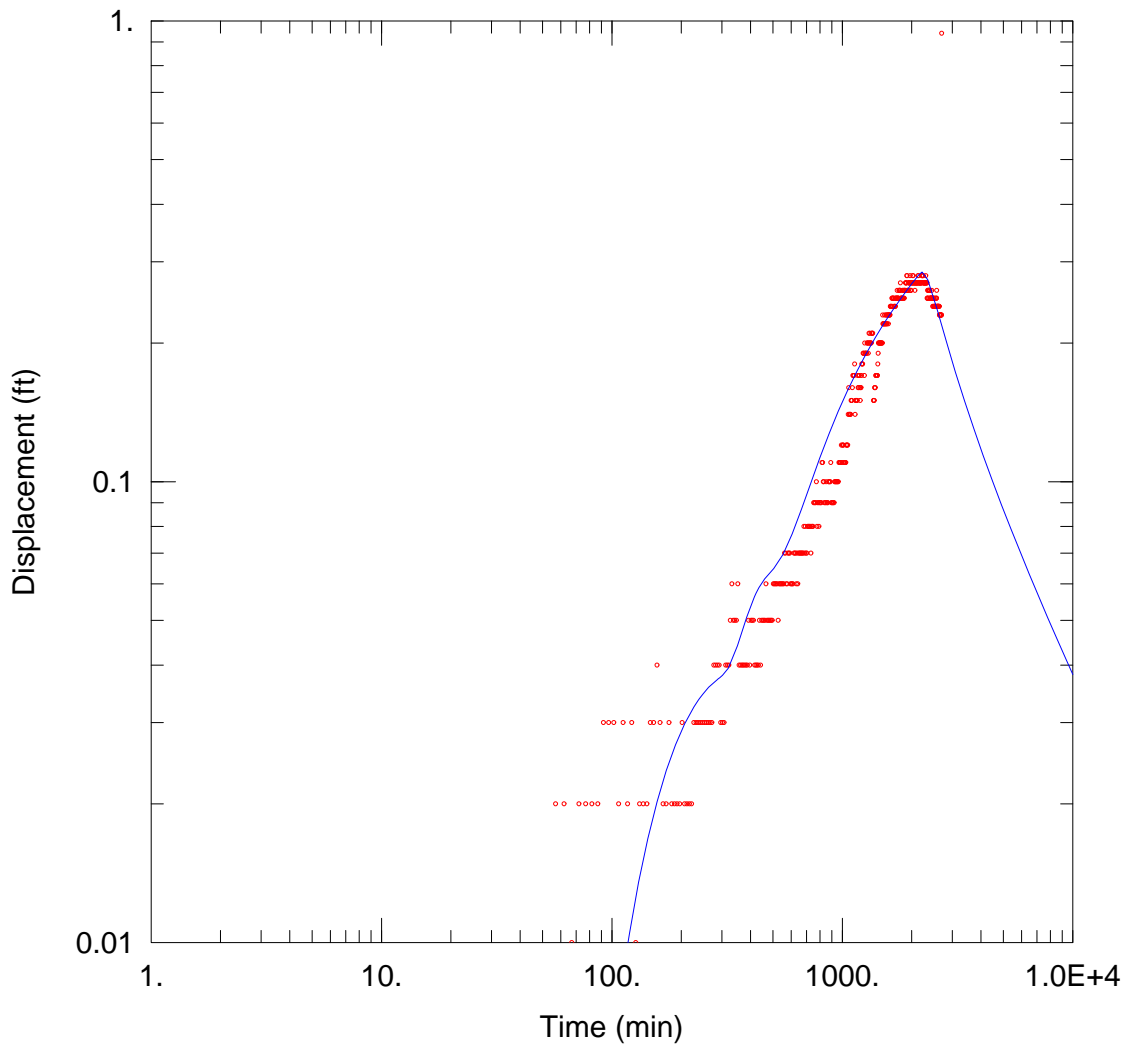
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 27.8 ft<sup>2</sup>/day

S = 0.00057



PLANT 2 SOUTH PW-14-01 CONSTANT-RATE TEST (FULL DURATION)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-01  
 Test Date: 10/8/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PW-14-01	547.2	787.24

Observation Wells

Well Name	X (ft)	Y (ft)
• TW-14-01	501.21	777.74

SOLUTION

Aquifer Model: Confined

Solution Method: Dougherty-Babu

T = 8.9 ft<sup>2</sup>/day

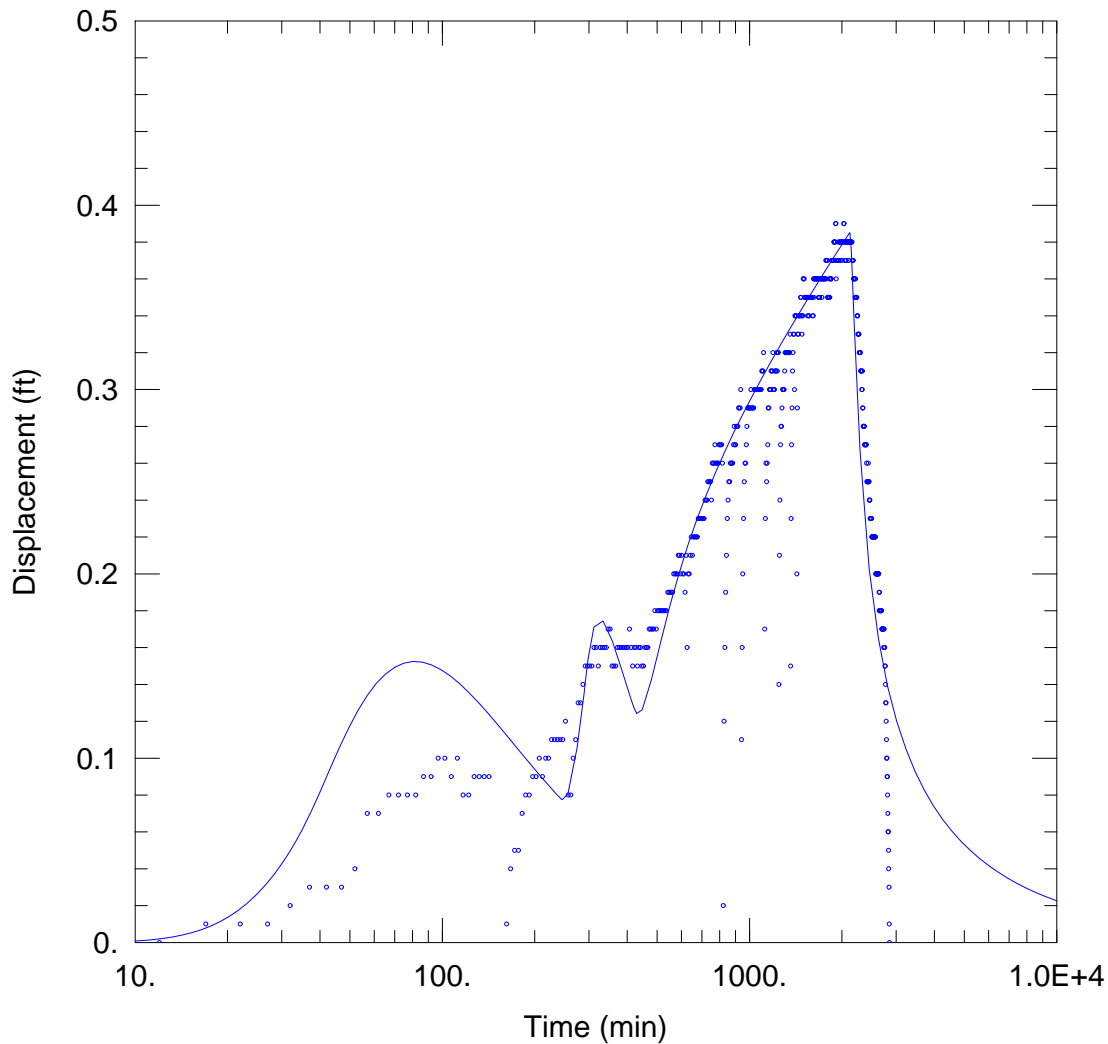
S = 0.0026

Kz/Kr = 1.

Sw = 0.

r(w) = 0.5 ft

r(c) = 0.5 ft



PLANT 2 SOUTH PW-14-01 CONSTANT-RATE TEST (FULL DURATION)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-01  
 Test Date: 10/8/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PW-14-01	547.2	787.24

Observation Wells

Well Name	X (ft)	Y (ft)
• TW-14-02	544.93	802.46

SOLUTION

Aquifer Model: Confined

Solution Method: Dougherty-Babu

T = 15.3 ft<sup>2</sup>/day

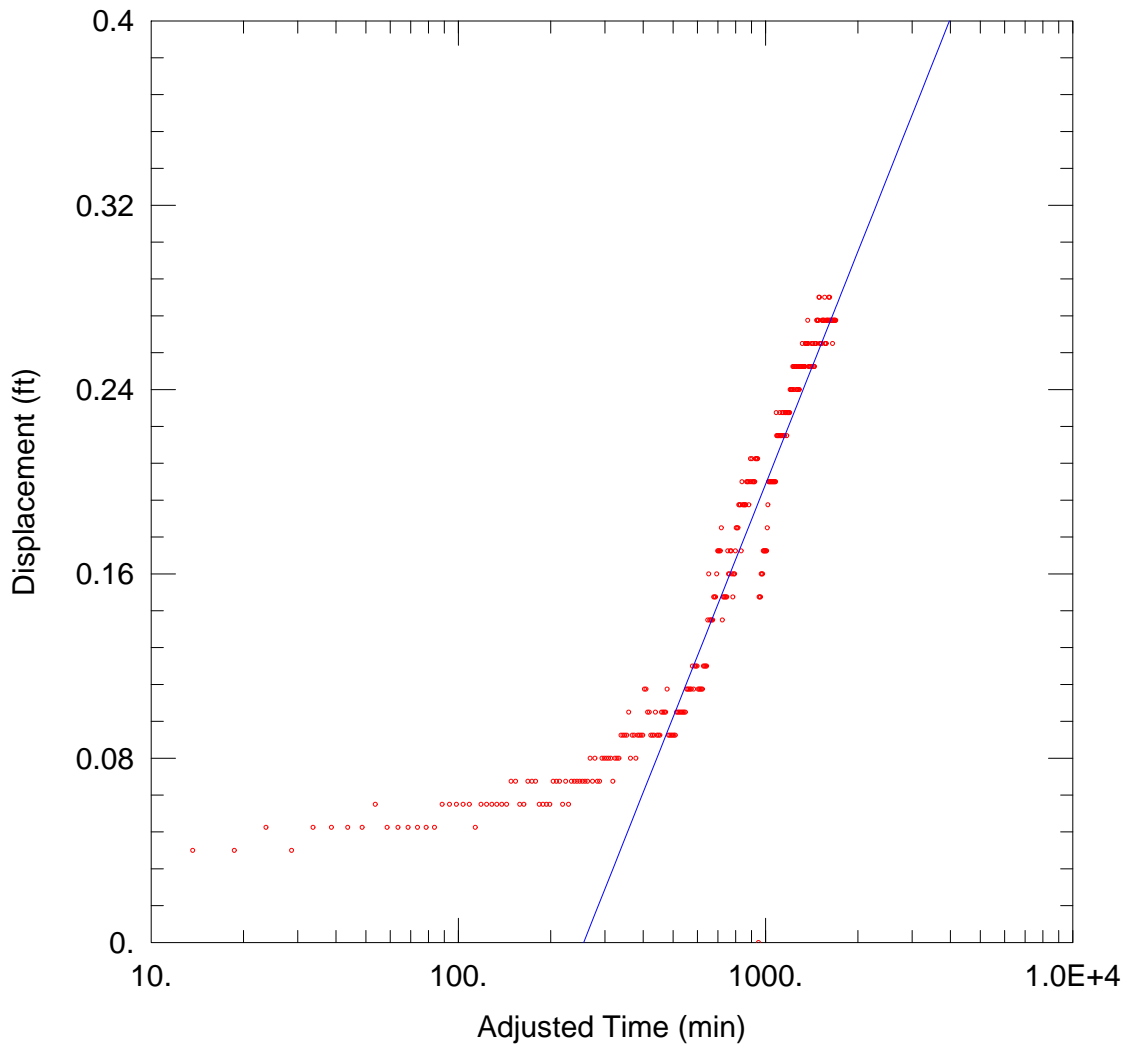
S = 0.0041

Kz/Kr = 1.

Sw = 0.

r(w) = 0.5 ft

r(c) = 0.5 ft



PLANT 2 SOUTH PW-14-01 CONSTANT-RATE TEST (LATE TIME)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-01  
 Test Date: 10/8/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PW-14-01	547.2	787.24

Observation Wells

Well Name	X (ft)	Y (ft)
• TW-14-01	501.21	777.74

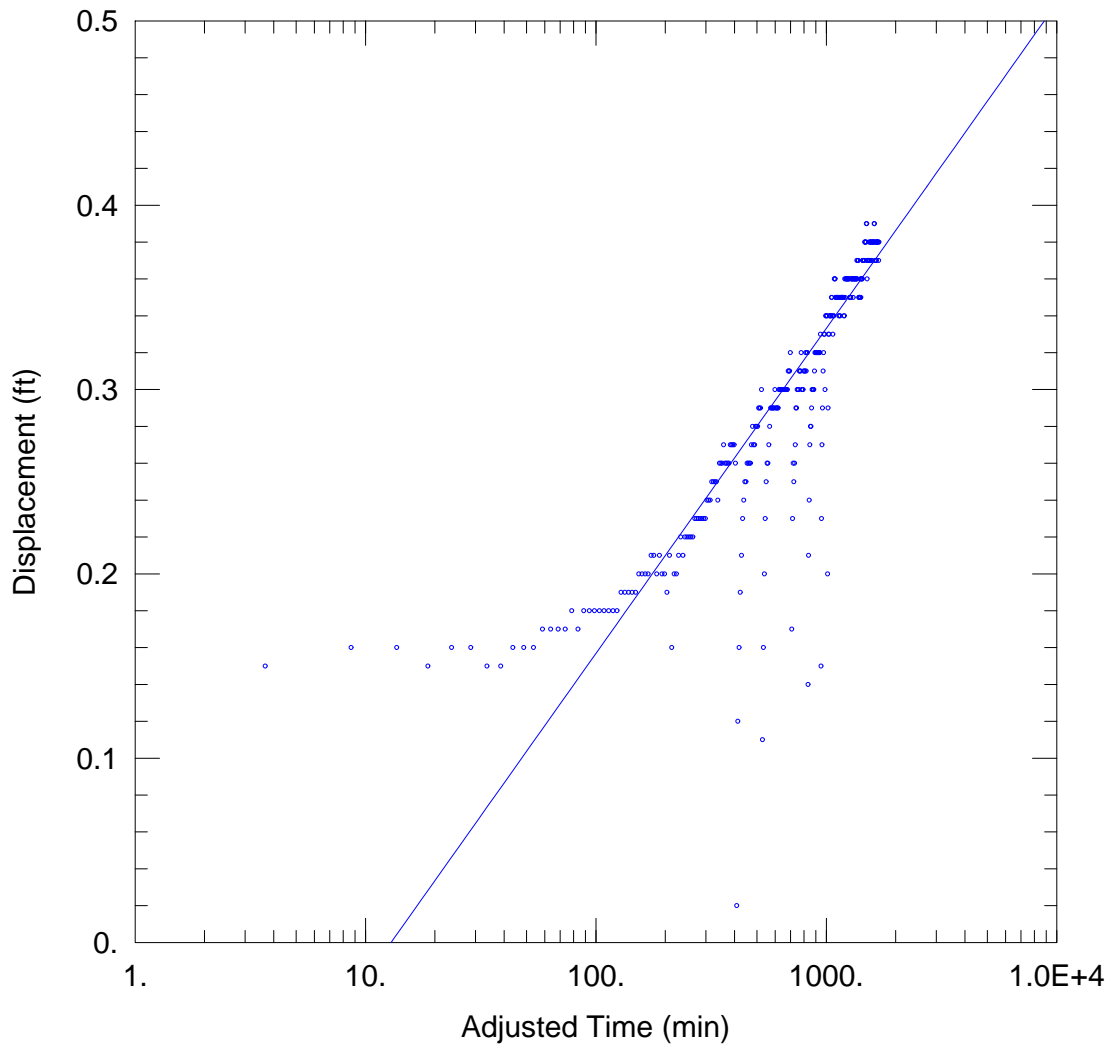
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 10.5 ft<sup>2</sup>/day

S = 0.0019



PLANT 2 SOUTH PW-14-01 CONSTANT-RATE TEST (LATE TIME)

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: PW-14-01  
 Test Date: 10/8/2014

AQUIFER DATA

Saturated Thickness: 15. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PW-14-01	547.2	787.24

Observation Wells

Well Name	X (ft)	Y (ft)
• TW-14-02	544.93	802.46

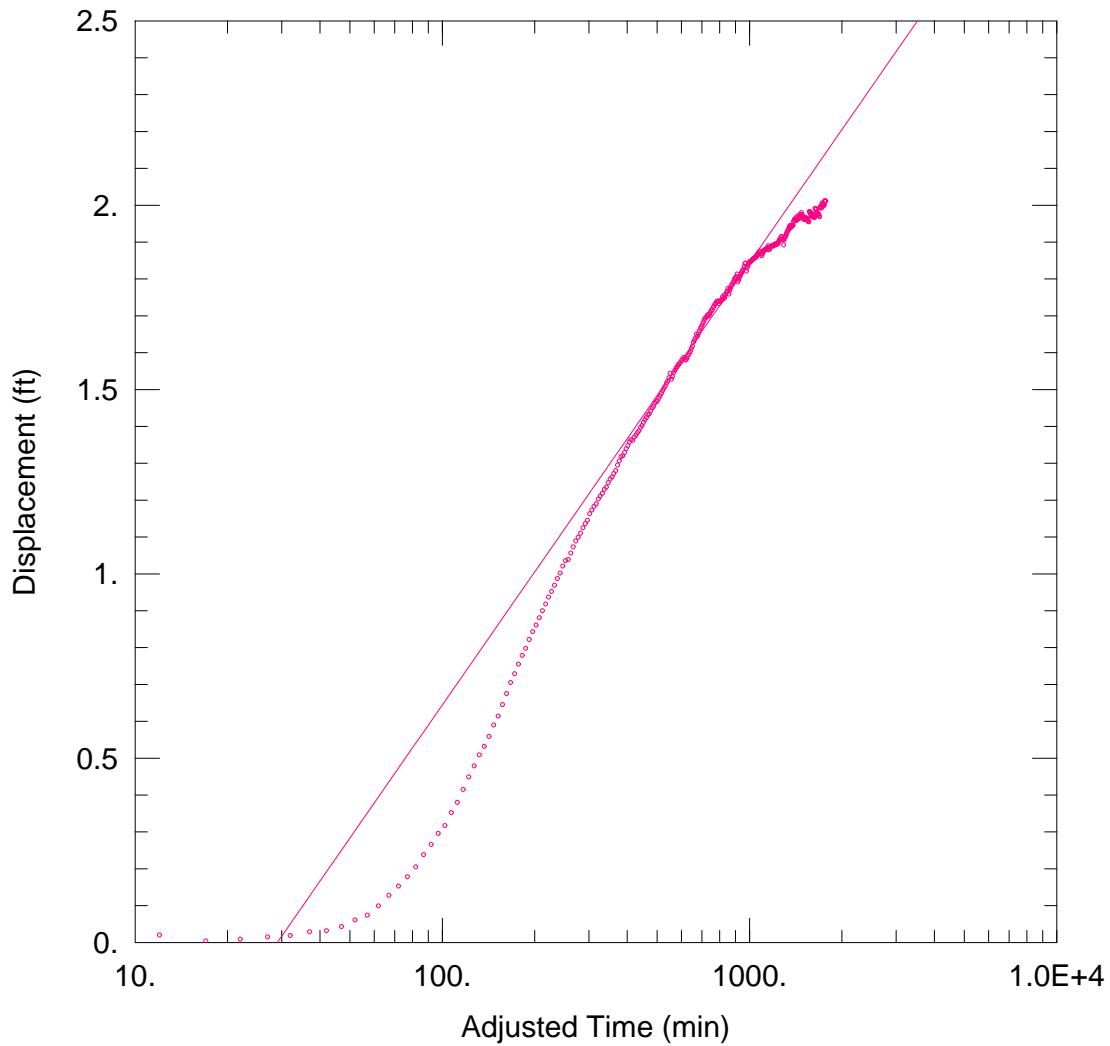
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 20. ft<sup>2</sup>/day

S = 0.0017



PLANT 3 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-07  
 Test Date: 10/16/2014

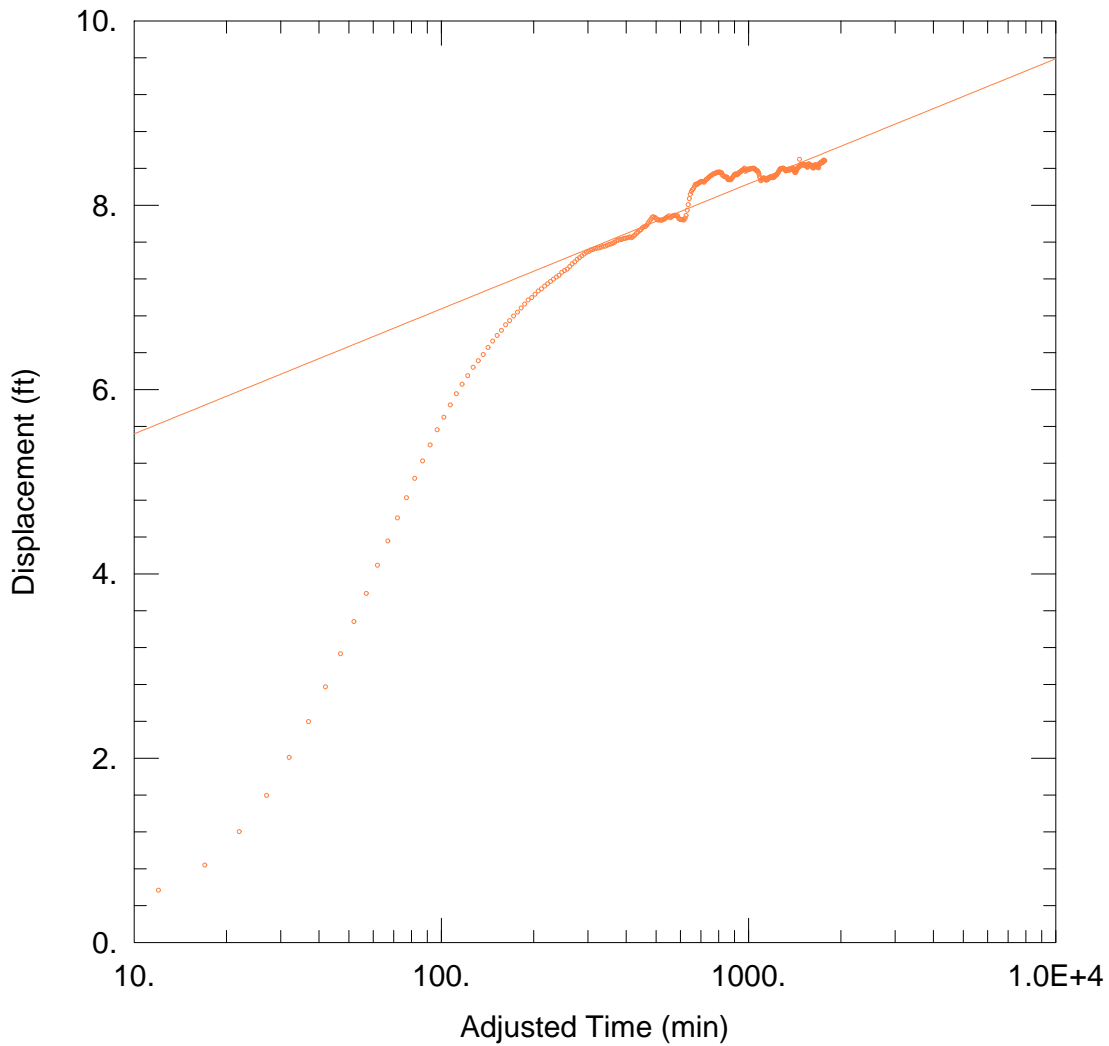
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
TW-14-07	859	760	• TW-14-09	886	736

SOLUTION

Aquifer Model: Confined  
 T = 147. ft<sup>2</sup>/day

Solution Method: Cooper-Jacob  
 S = 0.0051



PLANT 3 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-07  
 Test Date: 10/16/2014

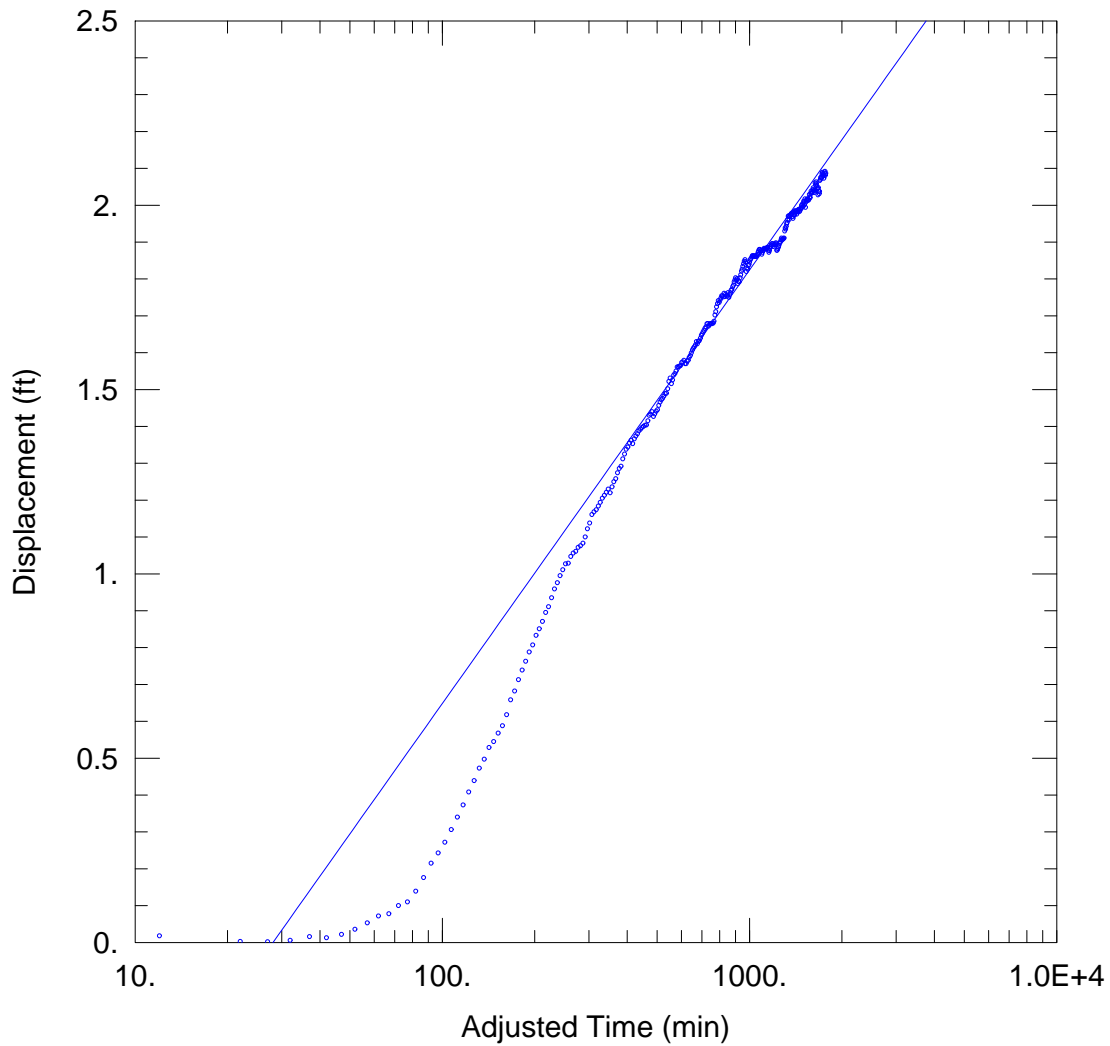
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
TW-14-07	859	760	• TW-14-08	871	750

SOLUTION

Aquifer Model: Confined  
 $T = 130. \text{ ft}^2/\text{day}$

Solution Method: Cooper-Jacob  
 $S = 7.1\text{E-}7$



PLANT 3 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-07  
 Test Date: 10/16/2014

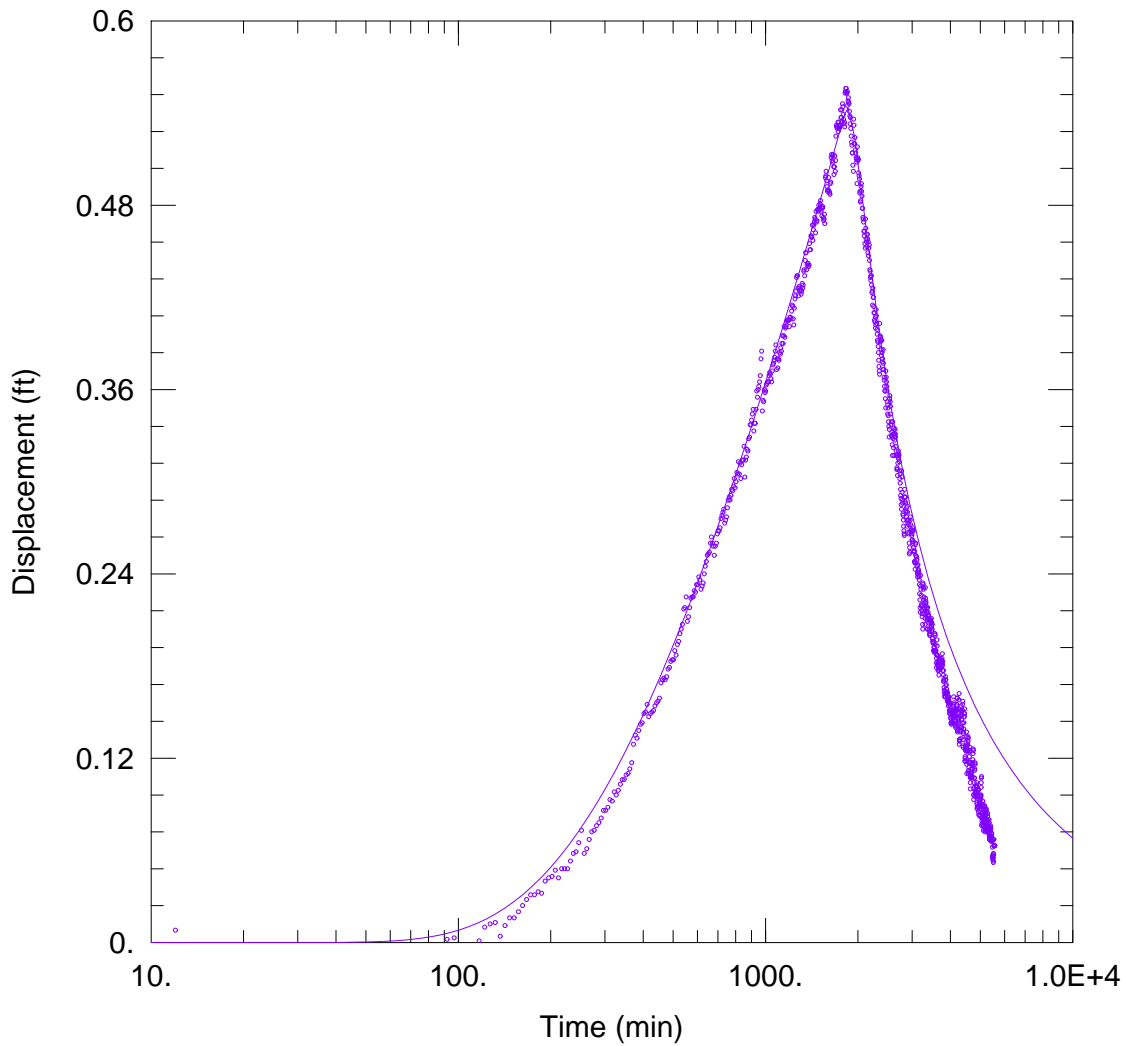
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
TW-14-07	859	760	• TW-14-06	900	762

SOLUTION

Aquifer Model: Confined  
 T = 150. ft<sup>2</sup>/day

Solution Method: Cooper-Jacob  
 S = 0.0039



PLANT 3 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-07  
 Test Date: 10/16/2014

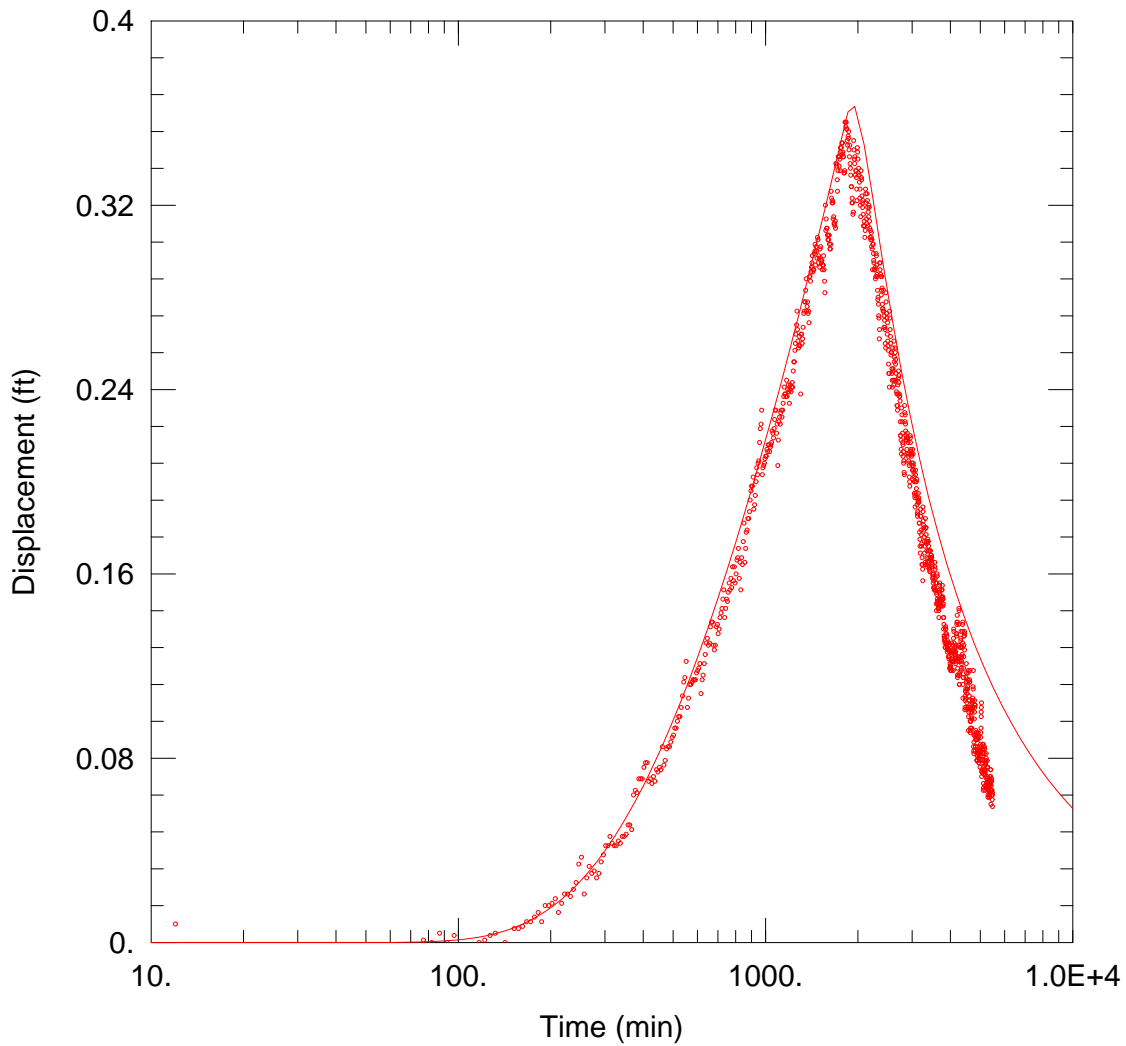
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
TW-14-07	859	760	• MW-13-28	829	838

SOLUTION

Aquifer Model: Confined  
 $T = 214. \text{ ft}^2/\text{day}$   
 $Kz/Kr = 1.$

Solution Method: Theis  
 $S = 0.022$   
 $b = 15. \text{ ft}$



PLANT 3 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-07  
 Test Date: 10/16/2014

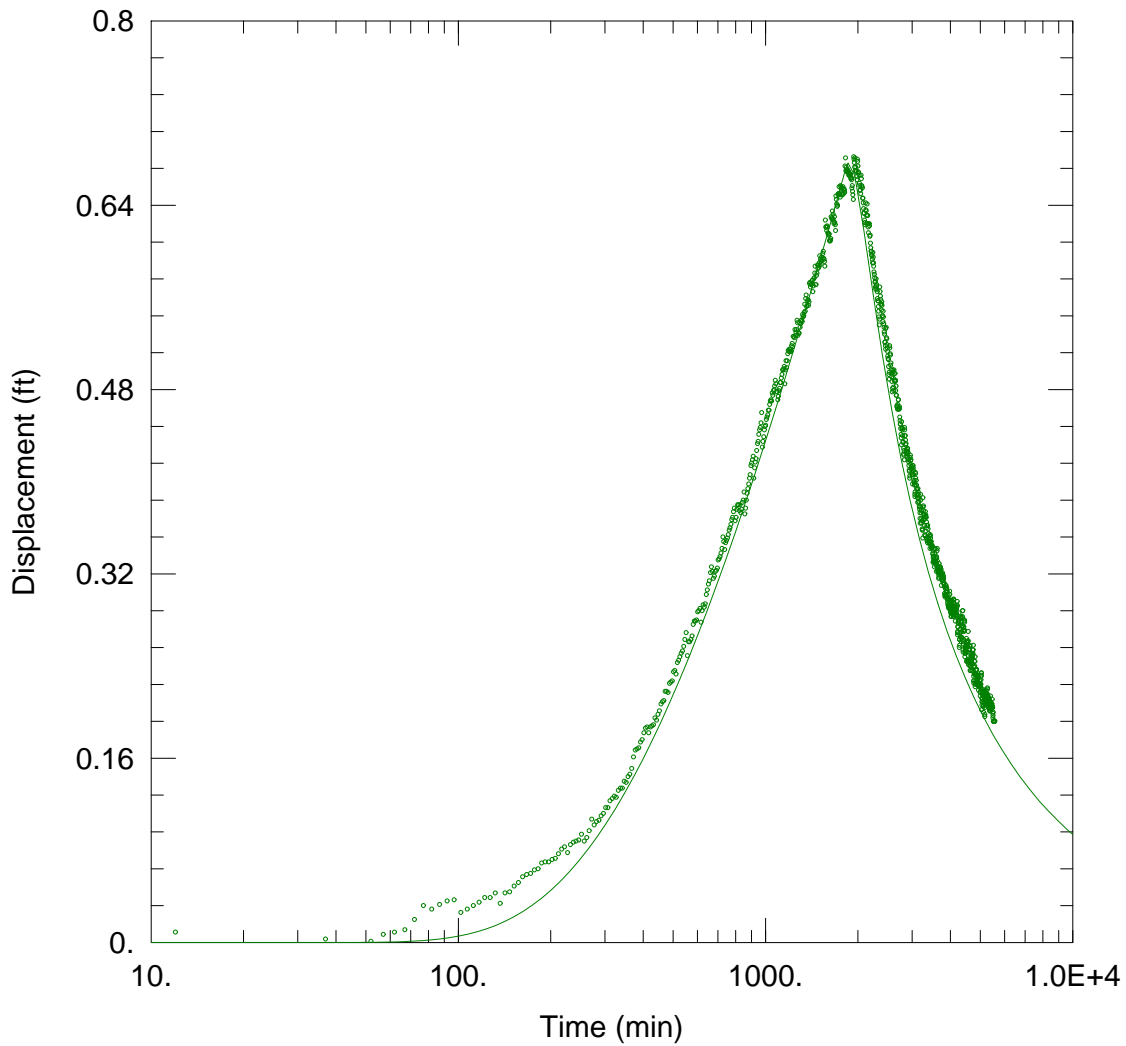
WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
TW-14-07	859	760	• MW-13-22	750	840

SOLUTION

Aquifer Model: Confined  
 $T = 246. \text{ ft}^2/\text{day}$   
 $Kz/Kr = 1.$

Solution Method: Theis  
 $S = 0.015$   
 $b = 15. \text{ ft}$



PLANT 3 INJECTION TEST

PROJECT INFORMATION

Company: ARCADIS  
 Client: RACER Trust  
 Project: B0064479.0014  
 Location: Lansing, MI  
 Test Well: TW-14-07  
 Test Date: 10/16/2014

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
TW-14-07	859	760	• PW-14-03	905	720

SOLUTION

Aquifer Model: Confined  
 $T = 154. \text{ ft}^2/\text{day}$   
 $Kz/Kr = 1.$

Solution Method: Theis  
 $S = 0.036$   
 $b = 15. \text{ ft}$

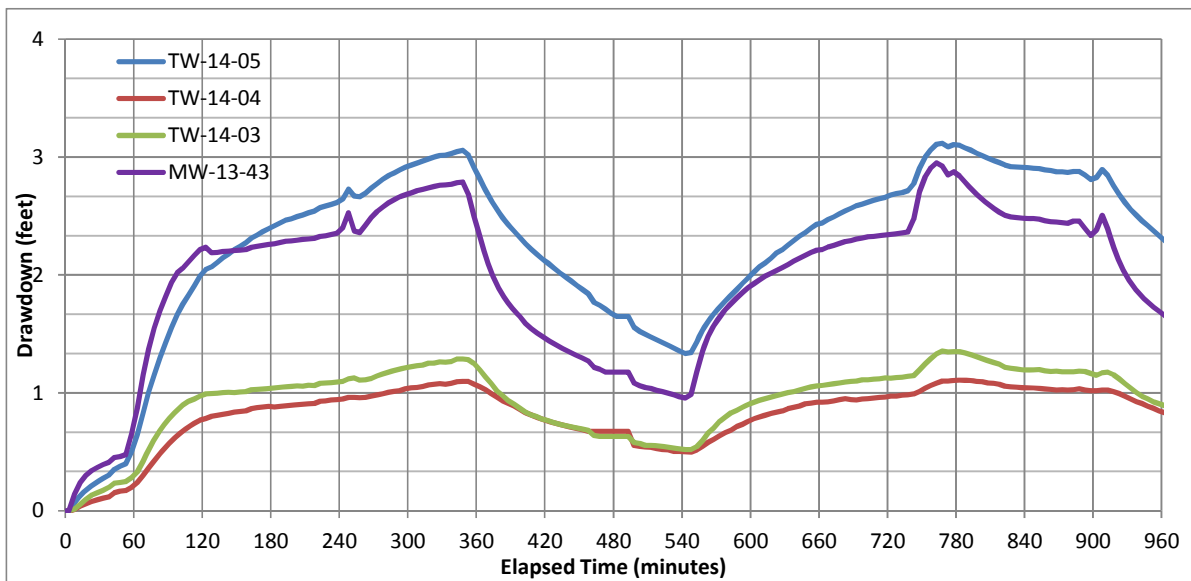
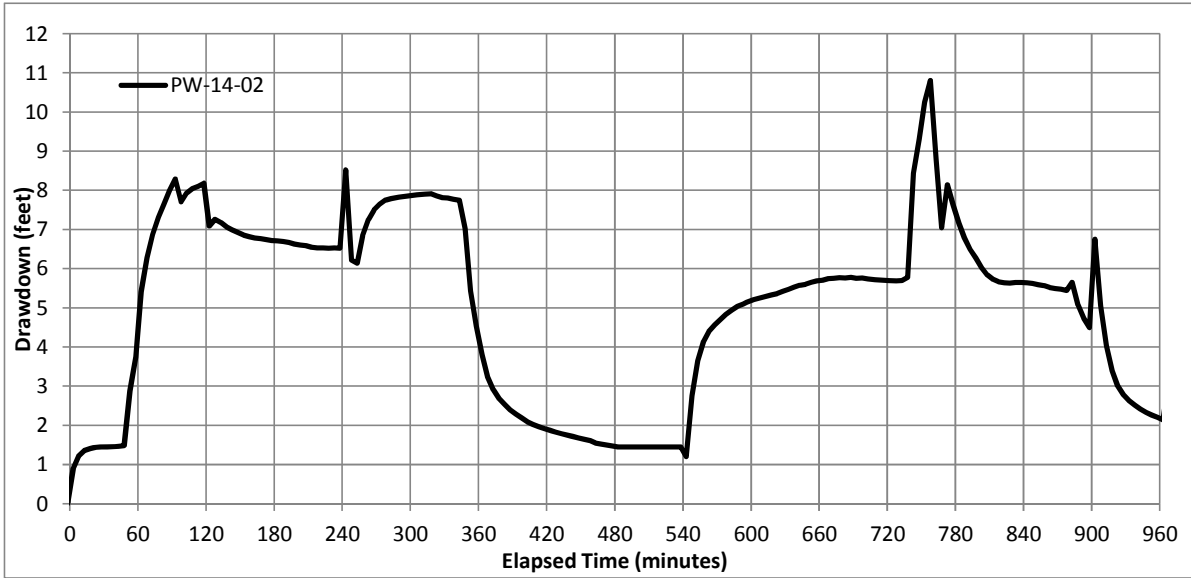


## **Appendix E**

Hydraulic Testing Summary  
Sheets

**PLANT 2 NORTH PUMPING TEST (EARLY TIME) - SUMMARY**

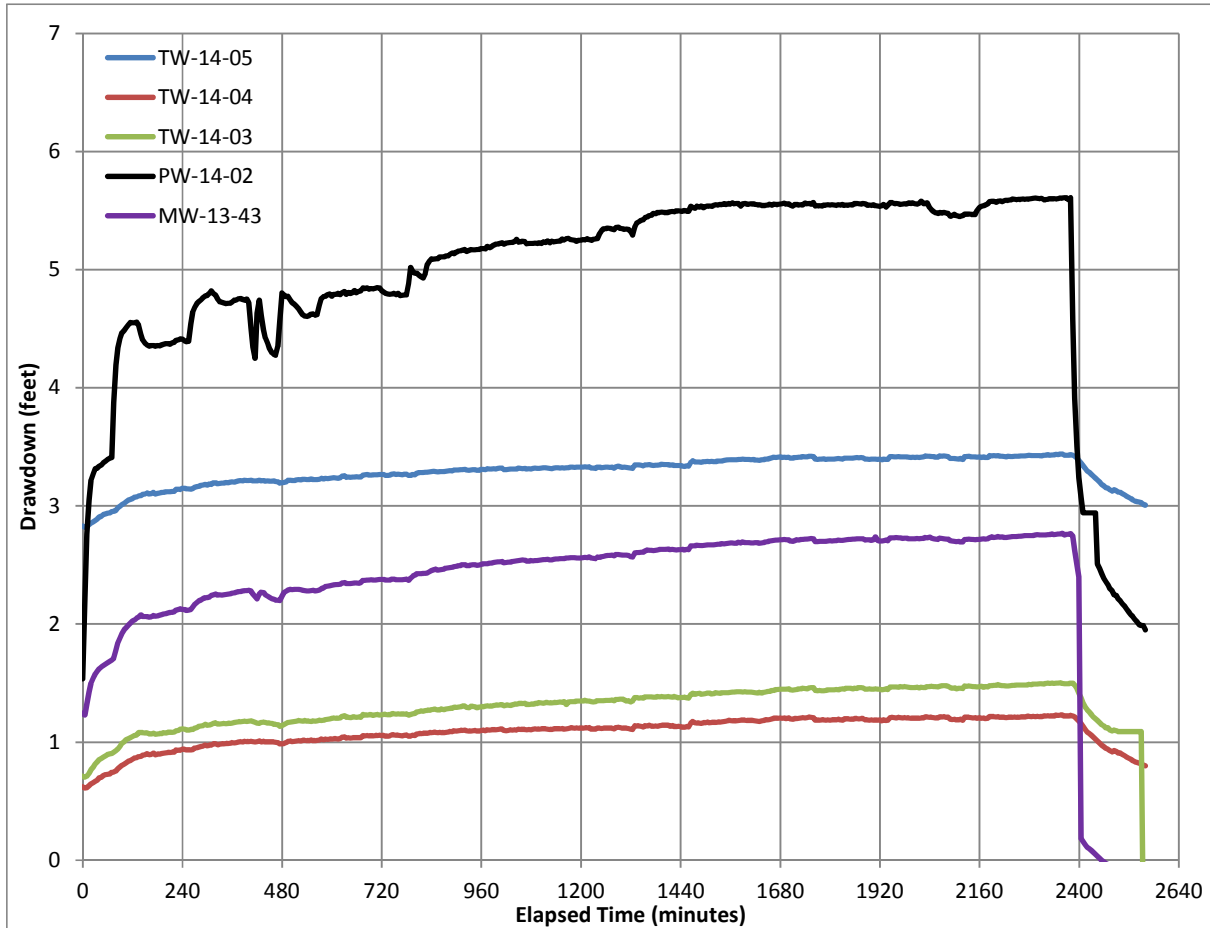
Pump on: 9/29/2014 15:13  
 Pump off: 9/30/2014 6:14  
 Duration (hrs): 15.0  
 Pumping Rates (gpm) Variable -0.3 to 1.65 gpm



WELL ID	Screened Interval (bgs)		Distance to Pumping Well (feet)	Maximum Displacement (feet)	Estimated Hydraulic Conductivity (feet/day)
	Top	Bottom			
PW-14-02	75	80	0	10.80	--
TW-14-05	72	77	16	3.12	0.8
MW-13-43	72	77	31	2.95	1.1
MW-13-44	96	115	31	ND	NA
TW-14-04	72	77	43	1.11	2.2
TW-14-03	75	80	53	1.35	2.5
MW-13-45	72	77	220	ND	NA
MW-13-42	70	75	276	NA	NA

**PLANT 2 NORTH PUMPING TEST (LATE TIME) - SUMMARY**

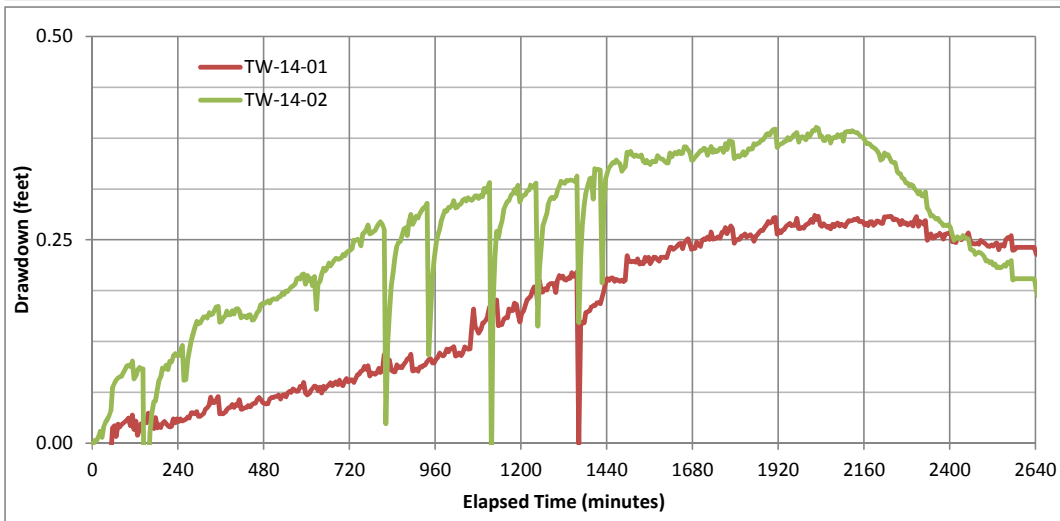
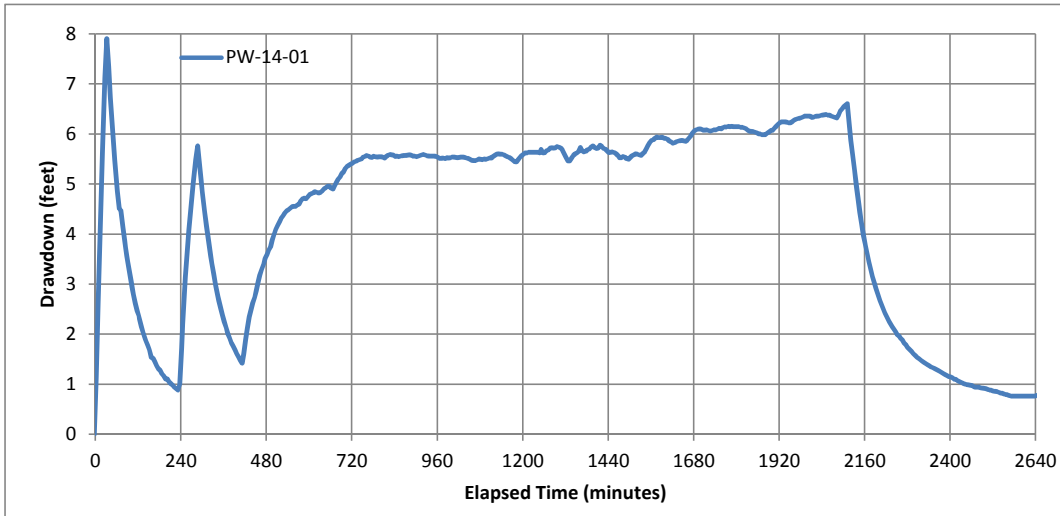
Pump on: 9/30/2014 16:31  
 Pump off: 10/2/2014 8:10  
 Duration (hrs): 39.7  
 Representative Pumping Rate: 0.5 gpm (0.38 to 0.5 gpm)



WELL ID	Screened Interval (bgs)		Distance to Pumping Well (feet)	Maximum Displacement (feet)	Estimated Hydraulic Conductivity (feet/day)
	Top	Bottom			
PW-14-02	75	80	0	5.61	--
TW-14-05	72	77	16	3.44	4.1
MW-13-43	72	77	31	2.77	1.7
MW-13-44	96	115	31	ND	NA
TW-14-04	72	77	43	1.23	4.1
TW-14-03	75	80	53	1.50	3.2
MW-13-45	72	77	220	ND	NA
MW-13-42	70	75	276	ND	NA

**PLANT 2 SOUTH PUMPING TEST (FULL DURATION) - SUMMARY**

Pump on: 10/8/14 13:58  
 Pump off: 10/10/14 1:10  
 Duration (hrs): 35.2  
 Pumping Rates: 0.5, 0.9, 0.1 gpm



WELL ID	Screened Interval (bgs)		Distance to Pumping Well (feet)	Maximum Displacement (feet)	Estimated Hydraulic Conductivity (feet/day)
	Top	Bottom			
PW-14-01	72	77	0	7.92	--
TW-14-02	67	72	15	0.39	1.0
TW-14-01	70	75	47	0.28	0.6
MW-12-01	87	110	399	ND	ND

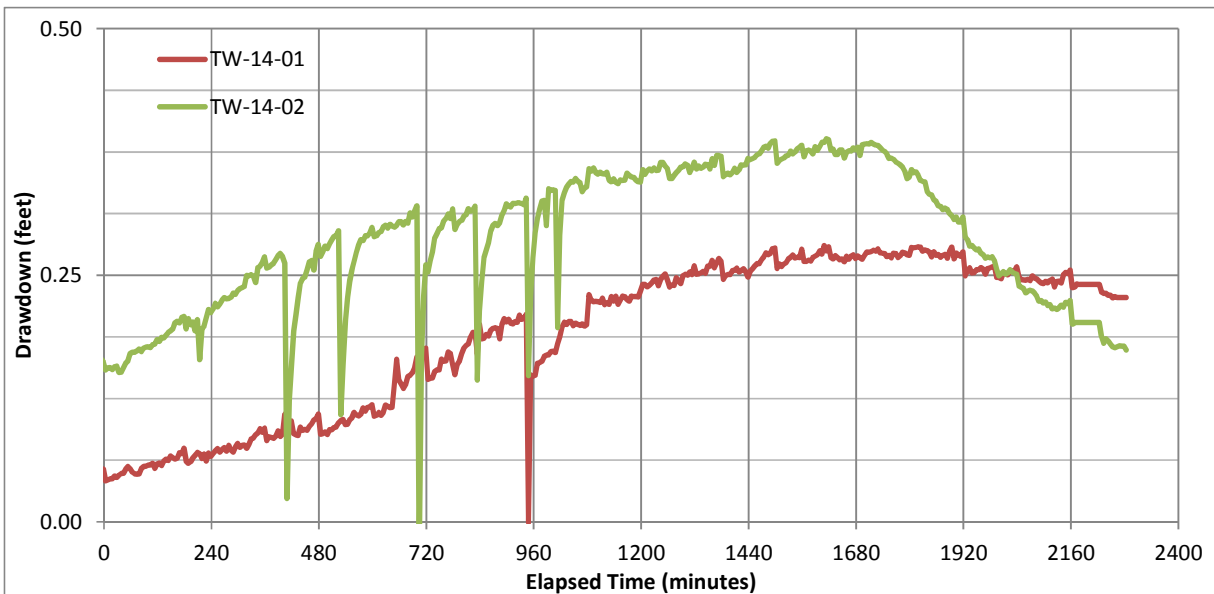
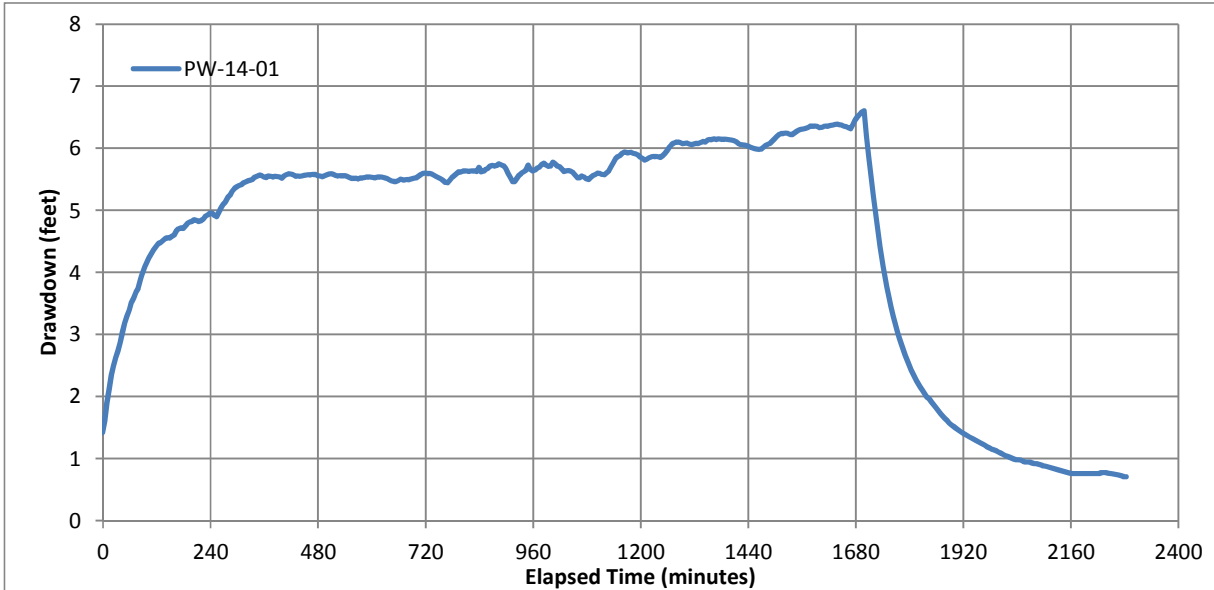
**PLANT 2 SOUTH PUMPING TEST (LATE TIME) - SUMMARY**

Pump on: 10/8/14 20:51

Pump off: 10/10/14 1:10

Duration (hrs): 28.3

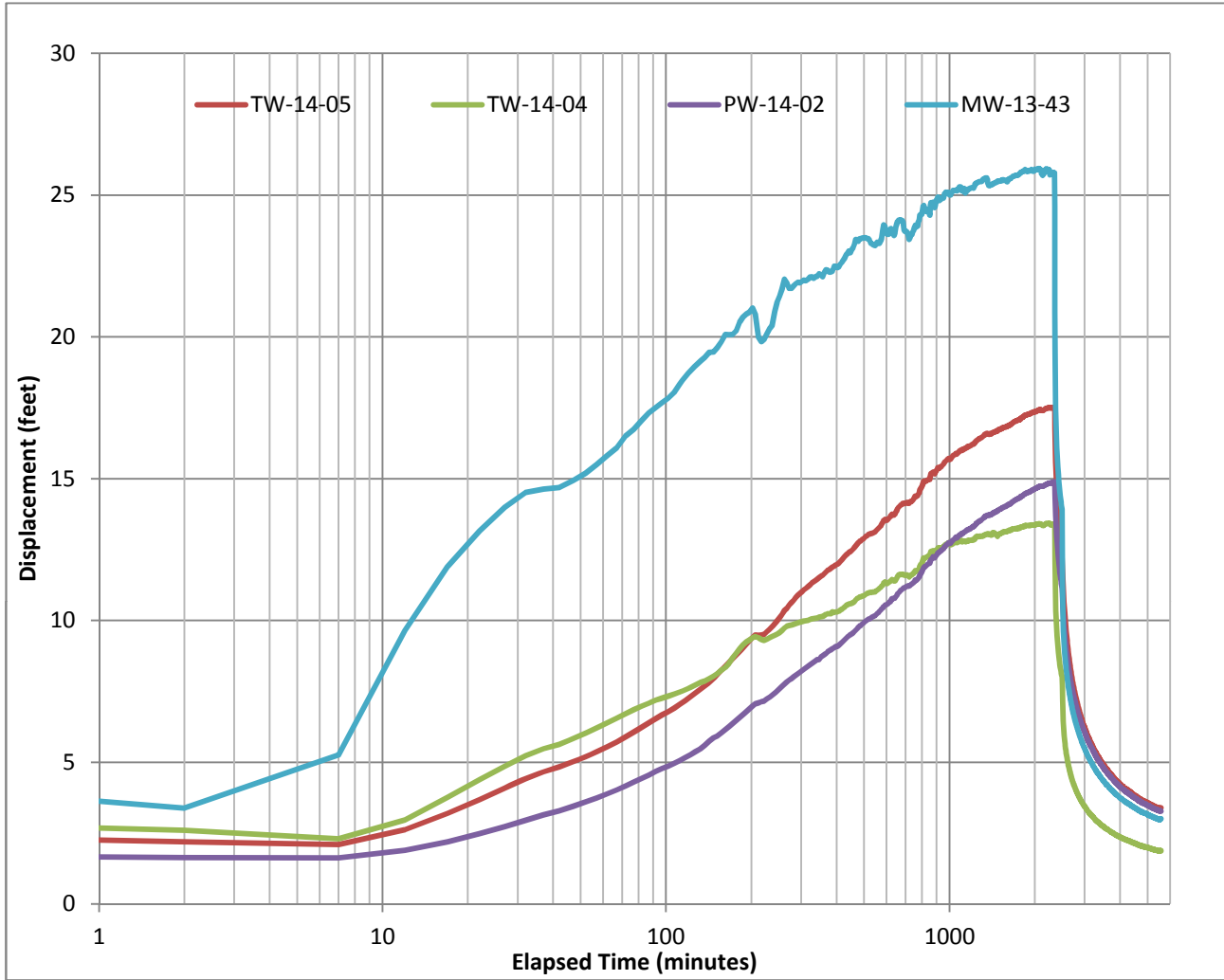
Representative Pumping Rate: 0.1 gpm (0.06 to 0.1 gpm)



WELL ID	Screened Interval (bgs)		Distance to Pumping Well (feet)	Maximum Displacement (feet)	Estimated Hydraulic Conductivity (ft/day)
	Top	Bottom			
PW-14-01	72	77	0	6.62	--
TW-14-02	67	72	15	0.39	1.3
TW-14-01	70	75	47	0.28	0.7
MW-12-01	87	110	399	ND	ND

## PLANT 2 NORTH INJECTION TEST - SUMMARY

Injection start: 10/2/2014 13:18  
 Injection end: 10/4/2014 4:23  
 Duration (hrs): 39.1  
 Representative Injection Rate: 6.5



WELL ID	Screened Interval (bgs)		Distance to Injection Well (feet)	Maximum Displacement (feet)	Estimated Hydraulic Conductivity (feet/day)
	Top	Bottom			
TW-14-03	75	80	0	66.85	--
MW-13-43	72	77	21	25.94	2.3
TW-14-05	72	77	36	17.51	1.6
TW-14-04	72	77	41	13.43	2.9
PW-14-02	75	80	53	14.87	1.8
MW-13-44	96	115	24	NA	NA
MW-13-45	72	77	235	NA	NA
MW-13-42	70	75	269	NA	NA

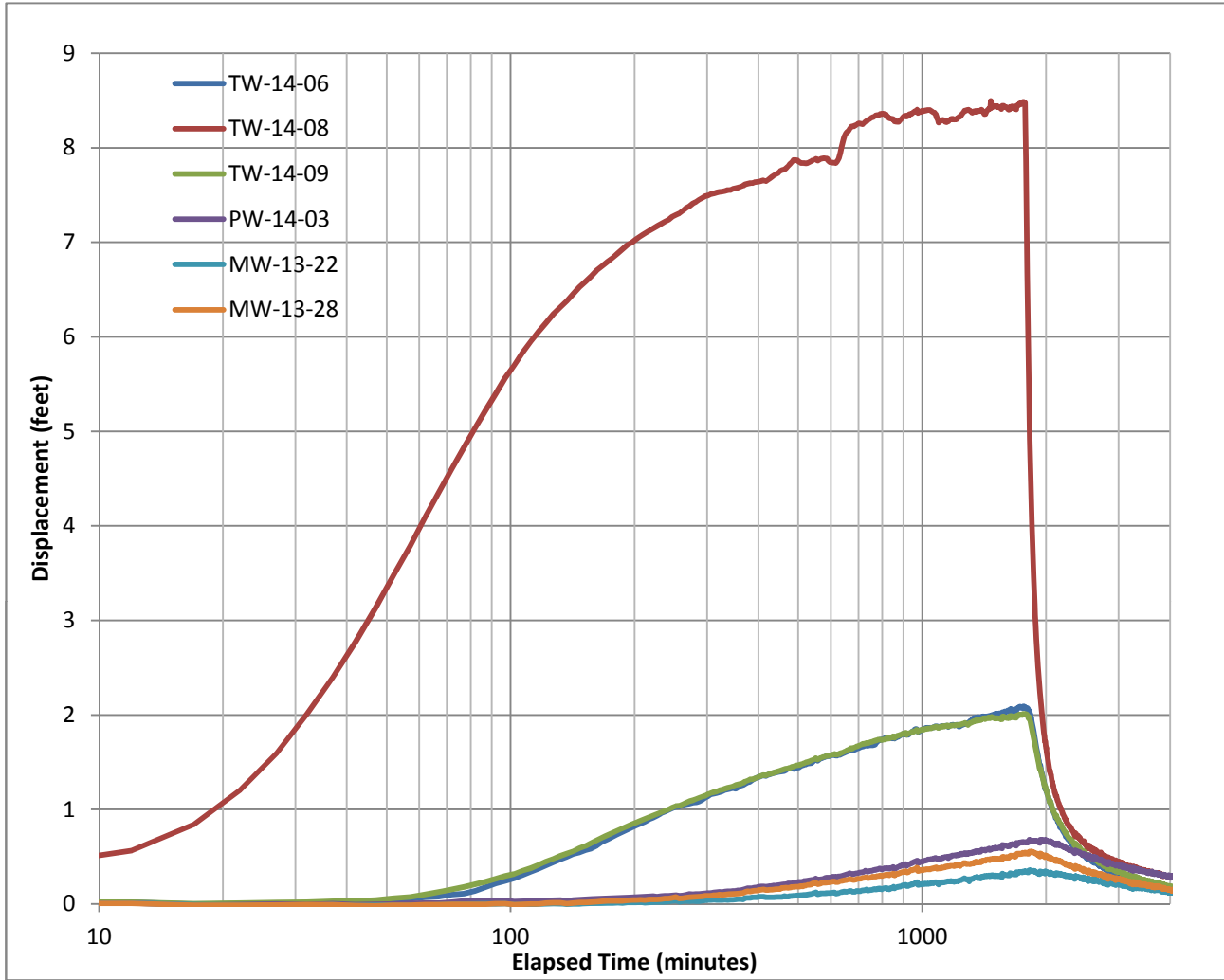
### PLANT 3 INJECTION TEST - SUMMARY

Injection start: 10/16/2014 13:38

Injection end: 10/17/2014 19:12

Duration: 30 hours

Representative Injection rate: 5 gpm



WELL ID	Screened Interval (bgs)		Distance to Injection Well (feet)	Maximum Displacement (feet)	Estimated Hydraulic Conductivity (ft/day)
	Top	Bottom			
TW-14-07	83	88	0	72.42	--
TW-14-08	84	89	16	8.50	8.7
TW-14-09	84	89	37	2.01	9.8
TW-14-06	82	87	42	2.09	10.0
PW-14-03	78	85	61	0.68	10.3
MW-13-28	99	116	83	0.56	14.3
MW-13-22	89	94	135	0.36	16.4
MW-13-25	67	72	147	ND	NA
MW-13-29	68	73	165	ND	NA



## **Appendix F**

Laboratory Reports



# Quality Control Report

Report ID: QC-S63010.01(01)  
Generated on 10/27/2014

Report to  
Attention: Randy Christensen  
Arcadis  
28550 Cabot Drive  
Suite 500  
Novi, MI 48377

Phone: 810-225-1940 FAX: 248-994-2241

Report Produced by  
Merit Laboratories  
2680 East Lansing Drive  
East Lansing, MI 48823  
Phone: (517) 332-0167 FAX: (517) 332-6333

## Report Summary

Lab Sample ID(s): S63010.01-S63010.06  
Project: B0064479.0014.00501 / RACER Lansing  
Submitted Date/Time: 10/02/2014 14:15  
Sampled by: Adam Richmond  
P.O. #: B0064479.0014.00501

## Report Sections

Cover Page (Page 1)  
Analysis Summary (Pages 2-7)  
Prep Batch Summary (Page 8)  
Surrogates per Lab Sample (Pages 9-14)  
Surrogates per QC Sample (Pages 15-17)  
Batch QC Results (Pages 18-25)

## Report Flag Descriptions

\*: QC result is outside of indicated control limits  
W: Surrogate result not applicable due to sample dilution

## Report Notes

Results relate only to items tested as received by the laboratory.  
Methods may be modified for improved performance.  
Results reported on a dry weight basis where applicable.  
"Not detected" indicates that parameter was not found at a level equal to or greater than the RDL.  
Report shall not be reproduced except in full, without the written approval of Merit Laboratories.

## Laboratory Certifications:

Michigan DNRE (#9956), DOD/ISO 17025 (#69699), WBENC (#2005110032), Ohio EPA (#CL0002), IN Drinking Water (#C-MI-07), NELAC NY (#11814)  
Some analytes reported may not be certified. Full certification lists are available upon request.

Barbara Ball  
Quality Assurance Manager

## QC Report - Analysis Summary

**Lab Sample ID: S63010.01**

Sample Tag: PW-14-02(093014)Begin

Collected Date/Time: 09/30/2014 05:50

Matrix: Liquid

COC Reference: 87204

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<b>Metals</b>						
Iron	SW6020A	10/09/14 12:52	MT3-14-1009B	MTD-100914-3	No	LCS/BLK/MS/MSD
<b>Organics - Volatiles</b>						
1,4-Dioxane	SW8260B - SIM	10/13/14 17:41	141013A6	VS141013W1	Yes	LCS/BLK/LCSD
TCL Volatile Organics 8260	SW8260C	10/07/14 16:56	141007A7	VF141007W1	Yes	LCS/BLK/LCSD

## QC Report - Analysis Summary

**Lab Sample ID: S63010.02**

Sample Tag: PW-14-02(093014)Begin-2

Collected Date/Time: 09/30/2014 10:00

Matrix: Liquid

COC Reference: 87204

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<b>Metals</b>						
Iron	SW6020A	10/09/14 12:49	MT3-14-1009B	MTD-100914-3	No	LCS/BLK/MS/MSD
<b>Organics - Volatiles</b>						
1,4-Dioxane	SW8260B - SIM	10/13/14 17:59	141013A6	VS141013W1	Yes	LCS/BLK/LCSD
TCL Volatile Organics 8260	SW8260C	10/07/14 17:18	141007A7	VF141007W1	Yes	LCS/BLK/LCSD

## QC Report - Analysis Summary

**Lab Sample ID: S63010.03**

Sample Tag: PW-14-02(093014)Begin-3

Collected Date/Time: 09/30/2014 16:30

Matrix: Liquid

COC Reference: 87204

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<b>Metals</b>						
Iron	SW6020A	10/09/14 12:54	MT3-14-1009B	MTD-100914-3	No	LCS/BLK/MS/MSD
<b>Organics - Volatiles</b>						
1,4-Dioxane	SW8260B - SIM	10/13/14 18:18	141013A6	VS141013W1	Yes	LCS/BLK/LCSD
TCL Volatile Organics 8260	SW8260C	10/07/14 17:40	141007A7	VF141007W1	Yes	LCS/BLK/LCSD

## QC Report - Analysis Summary

**Lab Sample ID: S63010.04**

Sample Tag: PW-14-02(100114)Mid

Collected Date/Time: 10/01/2014 16:30

Matrix: Liquid

COC Reference: 87204

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<b>Metals</b>						
Iron	SW6020A	10/09/14 12:56	MT3-14-1009B	MTD-100914-3	No	LCS/BLK/MS/MSD
<b>Organics - Volatiles</b>						
1,4-Dioxane	SW8260B - SIM	10/14/14 21:32	141014B6	VS141014W2	Yes	LCS/BLK/LCSD
TCL Volatile Organics 8260	SW8260C	10/07/14 18:02	141007A7	VF141007W1	Yes	LCS/BLK/LCSD

## QC Report - Analysis Summary

**Lab Sample ID: S63010.05**

Sample Tag: PW-14-02(100214)36H

Collected Date/Time: 10/02/2014 04:30

Matrix: Liquid

COC Reference: 87204

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<b>Metals</b>						
Iron	SW6020A	10/09/14 13:00	MT3-14-1009B	MTD-100914-3	No	LCS/BLK/MS/MSD
<b>Organics - Volatiles</b>						
1,4-Dioxane	SW8260B - SIM	10/13/14 18:55	141013A6	VS141013W1	Yes	LCS/BLK/LCSD
TCL Volatile Organics 8260	SW8260C	10/07/14 18:24	141007A7	VF141007W1	Yes	LCS/BLK/LCSD

## QC Report - Analysis Summary

**Lab Sample ID: S63010.06**

Sample Tag: Source Water(100214)

Collected Date/Time: 10/02/2014 14:00

Matrix: Liquid

COC Reference: 87204

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<b>Metals</b>						
Iron	SW6020A	10/09/14 12:58	MT3-14-1009B	MTD-100914-3	No	LCS/BLK/MS/MSD
<b>Organics - Volatiles</b>						
1,4-Dioxane	SW8260B - SIM	10/13/14 15:37	141013A6	VS141013W1	Yes	LCS/BLK/LCSD
TCL Volatile Organics 8260	SW8260C	10/07/14 18:46	141007A7	VF141007W1	Yes	LCS/BLK/LCSD

## QC Report - Prep Batch Summary

### Metals, Prep Batch ID: MTD-100914-3

Surrogates: No, QC Types: LCS/BLK/MS/MSD

Sample ID	Analysis	Method	Run Date/Time	Batch ID
S63010.01	Iron	SW6020A	10/09/14 12:52	MT3-14-1009B
S63010.02	Iron	SW6020A	10/09/14 12:49	MT3-14-1009B
S63010.03	Iron	SW6020A	10/09/14 12:54	MT3-14-1009B
S63010.04	Iron	SW6020A	10/09/14 12:56	MT3-14-1009B
S63010.05	Iron	SW6020A	10/09/14 13:00	MT3-14-1009B
S63010.06	Iron	SW6020A	10/09/14 12:58	MT3-14-1009B

### Organics - Volatiles, Prep Batch ID: VF141007W1

Surrogates: Yes, QC Types: LCS/BLK/LCSD

Sample ID	Analysis	Method	Run Date/Time	Batch ID
S63010.01	TCL Volatile Organics 8260	SW8260C	10/07/14 16:56	141007A7
S63010.02	TCL Volatile Organics 8260	SW8260C	10/07/14 17:18	141007A7
S63010.03	TCL Volatile Organics 8260	SW8260C	10/07/14 17:40	141007A7
S63010.04	TCL Volatile Organics 8260	SW8260C	10/07/14 18:02	141007A7
S63010.05	TCL Volatile Organics 8260	SW8260C	10/07/14 18:24	141007A7
S63010.06	TCL Volatile Organics 8260	SW8260C	10/07/14 18:46	141007A7

### Organics - Volatiles, Prep Batch ID: VS141013W1

Surrogates: Yes, QC Types: LCS/BLK/LCSD

Sample ID	Analysis	Method	Run Date/Time	Batch ID
S63010.01	1,4-Dioxane	SW8260B - SIM	10/13/14 17:41	141013A6
S63010.02	1,4-Dioxane	SW8260B - SIM	10/13/14 17:59	141013A6
S63010.03	1,4-Dioxane	SW8260B - SIM	10/13/14 18:18	141013A6
S63010.05	1,4-Dioxane	SW8260B - SIM	10/13/14 18:55	141013A6
S63010.06	1,4-Dioxane	SW8260B - SIM	10/13/14 15:37	141013A6

### Organics - Volatiles, Prep Batch ID: VS141014W2

Surrogates: Yes, QC Types: LCS/BLK/LCSD

Sample ID	Analysis	Method	Run Date/Time	Batch ID
S63010.04	1,4-Dioxane	SW8260B - SIM	10/14/14 21:32	141014B6

## QC Report - Surrogates per Lab Sample

**Lab Sample ID: S63010.01**

Sample Tag: PW-14-02(093014)Begin

Collected Date/Time: 09/30/2014 05:50

Matrix: Liquid

COC Reference: 87204

**Organics - Volatiles, Analysis: TCL Volatile Organics 8260**

Run in Batch: 141007A7, Run Date: 10/07/2014 16:56, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>103.80</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>92.40</b>	77.0	121.0
Toluene-D8		<b>96.60</b>	86.0	118.0

## QC Report - Surrogates per Lab Sample

**Lab Sample ID: S63010.02**

Sample Tag: PW-14-02(093014)Begin-2

Collected Date/Time: 09/30/2014 10:00

Matrix: Liquid

COC Reference: 87204

**Organics - Volatiles, Analysis: TCL Volatile Organics 8260**

Run in Batch: 141007A7, Run Date: 10/07/2014 17:18, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>99.60</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>93.60</b>	77.0	121.0
Toluene-D8		<b>98.20</b>	86.0	118.0

## QC Report - Surrogates per Lab Sample

**Lab Sample ID: S63010.03**

Sample Tag: PW-14-02(093014)Begin-3

Collected Date/Time: 09/30/2014 16:30

Matrix: Liquid

COC Reference: 87204

**Organics - Volatiles, Analysis: TCL Volatile Organics 8260**

Run in Batch: 141007A7, Run Date: 10/07/2014 17:40, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>100.40</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>95.20</b>	77.0	121.0
Toluene-D8		<b>98.60</b>	86.0	118.0

## QC Report - Surrogates per Lab Sample

**Lab Sample ID: S63010.04**

Sample Tag: PW-14-02(100114)Mid

Collected Date/Time: 10/01/2014 16:30

Matrix: Liquid

COC Reference: 87204

**Organics - Volatiles, Analysis: TCL Volatile Organics 8260**

Run in Batch: 141007A7, Run Date: 10/07/2014 18:02, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>97.40</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>95.80</b>	77.0	121.0
Toluene-D8		<b>98.60</b>	86.0	118.0

## QC Report - Surrogates per Lab Sample

**Lab Sample ID: S63010.05**

Sample Tag: PW-14-02(100214)36H

Collected Date/Time: 10/02/2014 04:30

Matrix: Liquid

COC Reference: 87204

**Organics - Volatiles, Analysis: TCL Volatile Organics 8260**

Run in Batch: 141007A7, Run Date: 10/07/2014 18:24, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>97.40</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>93.80</b>	77.0	121.0
Toluene-D8		<b>95.80</b>	86.0	118.0

## QC Report - Surrogates per Lab Sample

**Lab Sample ID: S63010.06**

Sample Tag: Source Water(100214)

Collected Date/Time: 10/02/2014 14:00

Matrix: Liquid

COC Reference: 87204

**Organics - Volatiles, Analysis: TCL Volatile Organics 8260**

Run in Batch: 141007A7, Run Date: 10/07/2014 18:46, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>101.80</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>94.40</b>	77.0	121.0
Toluene-D8		<b>96.40</b>	86.0	118.0

## QC Report - Surrogates per QC Sample

### Organics - Volatiles, Prep Batch ID: VF141007W1

QC Types: LCS/BLK/LCSD

#### Laboratory Control Sample (LCS)

Lab Sample ID: 141007a7.lcsw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 12:30, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>105.80</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>92.00</b>	77.0	121.0
Toluene-D8		<b>101.00</b>	86.0	118.0

#### Blank (BLK)

Lab Sample ID: 141007a7.blkw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 14:21, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>98.80</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>92.40</b>	77.0	121.0
Toluene-D8		<b>97.80</b>	86.0	118.0

#### Laboratory Control Sample Duplicate (LCSD)

Lab Sample ID: 141007a7.lcsw07b, Parent Sample ID: 141007a7.lcsw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 12:52, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
4-Bromofluorobenzene		<b>101.60</b>	83.0	119.0
1,2-Dichloroethane-D4		<b>91.60</b>	77.0	121.0
Toluene-D8		<b>95.60</b>	86.0	118.0

## QC Report - Surrogates per QC Sample

### Organics - Volatiles, Prep Batch ID: VS141013W1

QC Types: LCS/BLK/LCSD

#### Laboratory Control Sample (LCS)

Lab Sample ID: 141013a6.lcsw13a

Run in Batch: 141013A6, Run Date: 10/13/2014 12:52, Prep Date: 10/13/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
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No Surrogates

#### Blank (BLK)

Lab Sample ID: 141013a6.blkw13a

Run in Batch: 141013A6, Run Date: 10/13/2014 13:48, Prep Date: 10/13/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
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No Surrogates

#### Laboratory Control Sample Duplicate (LCSD)

Lab Sample ID: 141013a6.lcsw13b, Parent Sample ID: 141013a6.lcsw13a

Run in Batch: 141013A6, Run Date: 10/13/2014 13:11, Prep Date: 10/13/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
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No Surrogates

## QC Report - Surrogates per QC Sample

### Organics - Volatiles, Prep Batch ID: VS141014W2

QC Types: LCS/BLK/LCSD

#### Laboratory Control Sample (LCS)

Lab Sample ID: 141014b6.lcsw14a

Run in Batch: 141014B6, Run Date: 10/14/2014 14:29, Prep Date: 10/14/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
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No Surrogates

#### Blank (BLK)

Lab Sample ID: 141014b6.blkw14a

Run in Batch: 141014B6, Run Date: 10/14/2014 15:23, Prep Date: 10/14/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
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No Surrogates

#### Laboratory Control Sample Duplicate (LCSD)

Lab Sample ID: 141014b6.lcsw14b, Parent Sample ID: 141014b6.lcsw14a

Run in Batch: 141014B6, Run Date: 10/14/2014 14:47, Prep Date: 10/14/2014, Matrix: WW, Dilution: 1

Surrogate	Flags	%Rec	LCL	UCL
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No Surrogates

## QC Report - Batch QC Results

### Metals, Prep Batch ID: MTD-100914-3

Surrogates: No, QC Types: LCS/BLK/MS/MSD

#### Laboratory Control Sample (LCS)

Lab Sample ID: MT3-14-1009B.019.LCS

Run in Batch: MT3-14-1009B, Run Date: 10/09/2014 12:38, Prep Date: 10/09/2014, Matrix: Liquid, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL
Iron		101	85	115

#### Blank (BLK)

Lab Sample ID: MT3-14-1009B.020.LRB

Run in Batch: MT3-14-1009B, Run Date: 10/09/2014 12:40, Prep Date: 10/09/2014, Matrix: Liquid, Dilution: 1

Analyte	Flags	Conc	RDL	Units
Iron		ND	0.004	mg/L

#### Matrix Spike (MS)

Lab Sample ID: MT3-14-1009B.029.MS, Parent Sample ID: S63010.05

Run in Batch: MT3-14-1009B, Run Date: 10/09/2014 13:03, Prep Date: 10/09/2014, Matrix: Liquid, Dilution: 5

Analyte	Flags	% Rec	LCL	UCL
Iron		88	75	125

#### Matrix Spike Duplicate (MSD)

Lab Sample ID: MT3-14-1009B.030.MSD, Parent Sample ID: MT3-14-1009B.029.MS

Run in Batch: MT3-14-1009B, Run Date: 10/09/2014 13:05, Prep Date: 10/09/2014, Matrix: Liquid, Dilution: 5

Analyte	Flags	% Rec	LCL	UCL	RPD	RPD CL
Iron		88	75	125	0	20

## QC Report - Batch QC Results

### Organics - Volatiles, Prep Batch ID: VF141007W1

Surrogates: Yes, QC Types: LCS/BLK/LCSD

#### Laboratory Control Sample (LCS)

Lab Sample ID: 141007a7.lcsw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 12:30, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL
1,1,2-Trichloro-1,2,2-trifluoroethane		<b>90.62</b>	75.1	135.9
Diethyl ether		<b>79.98</b>	67.4	121.2
Acetone		<b>72.50</b>	29.9	161.5
Methyl iodide		<b>99.52</b>	68.8	116.4
Carbon disulfide		<b>100.64</b>	63.8	137.4
Methyl acetate		<b>90.70</b>	64.7	125.4
tert-Methyl butyl ether		<b>99.08</b>	73.2	122.4
Acrylonitrile		<b>92.60</b>	69.9	128.9
2-Butanone		<b>77.62</b>	44.0	134.4
Dichlorodifluoromethane		<b>78.96</b>	10.0	222.8
Chloromethane		<b>111.06</b>	23.8	166.5
Vinyl Chloride		<b>105.52</b>	43.5	149.1
Bromomethane		<b>105.70</b>	56.8	151.3
Chloroethane		<b>107.12</b>	53.4	149.4
Trichlorofluoromethane		<b>93.60</b>	59.7	151.8
1,1-Dichloroethene		<b>95.20</b>	69.6	139.4
Methylene Chloride		<b>97.46</b>	73.3	121.1
trans-1,2-Dichloroethene		<b>95.68</b>	73.6	129.3
1,1-Dichloroethane		<b>99.82</b>	71.5	126.2
cis-1,2-Dichloroethene		<b>101.22</b>	76.6	122.1
Tetrahydrofuran		<b>91.46</b>	59.0	117.9
Chloroform		<b>100.34</b>	78.4	124.0
Bromochloromethane		<b>102.40</b>	78.2	120.8
1,1,1-Trichloroethane		<b>106.00</b>	79.4	130.9
Cyclohexane		<b>91.48</b>	10.0	169.1
4-Methyl-2-pentanone		<b>99.84</b>	71.6	125.2
2-Hexanone		<b>87.08</b>	55.4	136.9
Carbon Tetrachloride		<b>110.04</b>	72.6	133.0
Benzene		<b>102.64</b>	79.9	124.9
1,2-Dichloroethane		<b>97.30</b>	76.0	126.3
Trichloroethene		<b>103.60</b>	79.7	124.2
1,2-Dichloropropane		<b>103.28</b>	78.6	126.4
Bromodichloromethane		<b>112.98</b>	80.4	128.2
Methyl cyclohexane		<b>98.56</b>	76.6	131.3
Dibromomethane		<b>105.32</b>	76.9	122.1
cis-1,3-Dichloropropene		<b>116.10</b>	79.8	129.9
Toluene		<b>104.70</b>	79.8	124.5
trans-1,3-Dichloropropene		<b>117.24</b>	74.0	131.3
1,1,2-Trichloroethane		<b>101.00</b>	78.7	123.1
Tetrachloroethene		<b>100.46</b>	74.5	124.5
trans-1,4-Dichloro-2-butene		<b>99.48</b>	68.6	135.4
Dibromochloromethane		<b>119.30</b>	74.6	127.2
1,2-Dibromoethane		<b>102.62</b>	70.3	133.7
Chlorobenzene		<b>102.90</b>	79.2	122.7
1,1,1,2-Tetrachloroethane		<b>113.22</b>	80.3	128.2
Ethylbenzene		<b>104.22</b>	79.5	129.1

## QC Report - Batch QC Results

### Organics - Volatiles, Prep Batch ID: VF141007W1 (continued)

Surrogates: Yes, QC Types: LCS/BLK/LCSD

### Laboratory Control Sample (LCS) (continued)

Lab Sample ID: 141007a7.lcsw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 12:30, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL
p,m-Xylene		104.61	79.4	132.2
o-Xylene		104.36	80.2	131.0
Styrene		112.70	69.5	126.7
Isopropylbenzene		105.60	74.4	121.5
Bromoform		110.78	69.4	128.0
1,1,2,2-Tetrachloroethane		100.86	79.8	126.3
1,2,3-Trichloropropane		97.62	78.3	138.8
n-Propylbenzene		105.28	82.0	130.7
Bromobenzene		105.66	78.7	124.6
1,3,5-Trimethylbenzene		106.36	81.3	128.9
tert-Butylbenzene		103.14	80.7	128.9
1,2,4-Trimethylbenzene		106.04	81.4	130.8
sec-Butylbenzene		106.40	77.4	129.8
p-Isopropyltoluene		106.10	79.8	137.5
1,3-Dichlorobenzene		104.66	77.0	131.3
1,4-Dichlorobenzene		102.50	20.7	137.7
1,2-Dichlorobenzene		103.36	10.0	166.2
1,2,3-Trimethylbenzene		104.82	76.3	124.2
n-Butylbenzene		106.20	80.0	133.3
Hexachloroethane		116.08	23.8	138.1
1,2-Dibromo-3-Chloropropane		106.50	21.2	189.4
1,2,4-Trichlorobenzene		112.56	27.4	143.4
1,2,3-Trichlorobenzene		109.84	75.4	131.4
Naphthalene		107.68	32.9	135.8
2-Methylnaphthalene		111.44	25.5	165.5

### Blank (BLK)

Lab Sample ID: 141007a7.blkw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 14:21, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Analyte	Flags	Conc	RDL	Units
1,1,2-Trichloro-1,2,2-trifluoroethane		ND	1	ug/l
Acetone		ND	10	ug/l
Carbon disulfide		ND	1	ug/l
Methyl Acetate		ND	1	ug/l
tert-Methyl butyl ether (MTBE)		ND	1	ug/l
2-Butanone (MEK)		ND	10	ug/l
Dichlorodifluoromethane		ND	1	ug/l
Chloromethane		ND	1	ug/l
Vinyl chloride		ND	1	ug/l
Bromomethane		ND	1	ug/l
Chloroethane		ND	1	ug/l
Trichlorofluoromethane		ND	1	ug/l
1,1-Dichloroethene		ND	1	ug/l
Methylene chloride		ND	1	ug/l
trans-1,2-Dichloroethene		ND	1	ug/l
1,1-Dichloroethane		ND	1	ug/l

## QC Report - Batch QC Results

### Organics - Volatiles, Prep Batch ID: VF141007W1 (continued)

Surrogates: Yes, QC Types: LCS/BLK/LCSD

### Blank (BLK) (continued)

Lab Sample ID: 141007a7.blkw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 14:21, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Analyte	Flags	Conc	RDL	Units
cis-1,2-Dichloroethene		ND	1	ug/l
Chloroform		ND	1	ug/l
1,1,1-Trichloroethane		ND	1	ug/l
Cyclohexane		ND	1	ug/l
4-Methyl-2-pentanone (MIBK)		ND	1	ug/l
2-Hexanone		ND	10	ug/l
Carbon tetrachloride		ND	1	ug/l
Benzene		ND	1	ug/l
1,2-Dichloroethane		ND	1	ug/l
Trichloroethene		ND	1	ug/l
1,2-Dichloropropane		ND	1	ug/l
Bromodichloromethane		ND	1	ug/l
Methyl cyclohexane		ND	1	ug/l
cis-1,3-Dichloropropene		ND	1	ug/l
Toluene		ND	1	ug/l
trans-1,3-Dichloropropene		ND	1	ug/l
1,1,2-Trichloroethane		ND	1	ug/l
Tetrachloroethene		ND	1	ug/l
Dibromochloromethane		ND	1	ug/l
Chlorobenzene		ND	1	ug/l
1,1,2,2-Tetrachloroethane		ND	1	ug/l
Ethylbenzene		ND	1	ug/l
p,m-Xylene		ND	1	ug/l
o-Xylene		ND	1	ug/l
Styrene		ND	1	ug/l
Isopropylbenzene		ND	1	ug/l
Bromoform		ND	1	ug/l
1,3-Dichlorobenzene		ND	1	ug/l
1,4-Dichlorobenzene		ND	1	ug/l
1,2-Dichlorobenzene		ND	1	ug/l
1,2,4-Trichlorobenzene		ND	1	ug/l

### Laboratory Control Sample Duplicate (LCSD)

Lab Sample ID: 141007a7.lcsw07b, Parent Sample ID: 141007a7.lcsw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 12:52, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL	RPD	RPD CL
1,1,2-Trichloro-1,2,2-trifluoroethane		85.50	75.1	135.9	5.8	30.0
Diethyl ether		89.80	67.4	121.2	11.6	30.0
Acetone		75.00	29.9	161.5	3.4	30.0
Methyl iodide		98.54	68.8	116.4	1.0	30.0
Carbon disulfide		99.70	63.8	137.4	0.9	30.0
Methyl acetate		95.06	64.7	125.4	4.7	30.0
tert-Methyl butyl ether		101.74	73.2	122.4	2.6	30.0
Acrylonitrile		100.50	69.9	128.9	8.2	30.0
2-Butanone		79.52	44.0	134.4	2.4	30.0
Dichlorodifluoromethane		74.84	10.0	222.8	5.4	30.0

## QC Report - Batch QC Results

### Organics - Volatiles, Prep Batch ID: VF141007W1 (continued)

Surrogates: Yes, QC Types: LCS/BLK/LCSD

### Laboratory Control Sample Duplicate (LCSD) (continued)

Lab Sample ID: 141007a7.lcsw07b, Parent Sample ID: 141007a7.lcsw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 12:52, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL	RPD	RPD CL
Chloromethane		<b>106.64</b>	23.8	166.5	<b>4.1</b>	30.0
Vinyl Chloride		<b>101.28</b>	43.5	149.1	<b>4.1</b>	30.0
Bromomethane		<b>104.98</b>	56.8	151.3	<b>0.7</b>	30.0
Chloroethane		<b>104.72</b>	53.4	149.4	<b>2.3</b>	30.0
Trichlorofluoromethane		<b>89.20</b>	59.7	151.8	<b>4.8</b>	30.0
1,1-Dichloroethene		<b>94.54</b>	69.6	139.4	<b>0.7</b>	30.0
Methylene Chloride		<b>96.46</b>	73.3	121.1	<b>1.0</b>	30.0
trans-1,2-Dichloroethene		<b>96.78</b>	73.6	129.3	<b>1.1</b>	30.0
1,1-Dichloroethane		<b>100.78</b>	71.5	126.2	<b>1.0</b>	30.0
cis-1,2-Dichloroethene		<b>102.06</b>	76.6	122.1	<b>0.8</b>	30.0
Tetrahydrofuran		<b>96.72</b>	59.0	117.9	<b>5.6</b>	30.0
Chloroform		<b>101.62</b>	78.4	124.0	<b>1.3</b>	30.0
Bromochloromethane		<b>104.48</b>	78.2	120.8	<b>2.0</b>	30.0
1,1,1-Trichloroethane		<b>104.60</b>	79.4	130.9	<b>1.3</b>	30.0
Cyclohexane		<b>89.26</b>	10.0	169.1	<b>2.5</b>	30.0
4-Methyl-2-pentanone		<b>104.50</b>	71.6	125.2	<b>4.6</b>	30.0
2-Hexanone		<b>87.72</b>	55.4	136.9	<b>0.7</b>	30.0
Carbon Tetrachloride		<b>107.26</b>	72.6	133.0	<b>2.6</b>	30.0
Benzene		<b>100.72</b>	79.9	124.9	<b>1.9</b>	30.0
1,2-Dichloroethane		<b>96.20</b>	76.0	126.3	<b>1.1</b>	30.0
Trichloroethene		<b>102.46</b>	79.7	124.2	<b>1.1</b>	30.0
1,2-Dichloropropane		<b>101.26</b>	78.6	126.4	<b>2.0</b>	30.0
Bromodichloromethane		<b>109.06</b>	80.4	128.2	<b>3.5</b>	30.0
Methyl cyclohexane		<b>94.92</b>	76.6	131.3	<b>3.8</b>	30.0
Dibromomethane		<b>103.82</b>	76.9	122.1	<b>1.4</b>	30.0
cis-1,3-Dichloropropene		<b>109.78</b>	79.8	129.9	<b>5.6</b>	30.0
Toluene		<b>100.12</b>	79.8	124.5	<b>4.5</b>	30.0
trans-1,3-Dichloropropene		<b>109.92</b>	74.0	131.3	<b>6.4</b>	30.0
1,1,2-Trichloroethane		<b>96.80</b>	78.7	123.1	<b>4.2</b>	30.0
Tetrachloroethene		<b>95.58</b>	74.5	124.5	<b>5.0</b>	30.0
trans-1,4-Dichloro-2-butene		<b>90.86</b>	68.6	135.4	<b>9.1</b>	30.0
Dibromochloromethane		<b>118.88</b>	74.6	127.2	<b>0.4</b>	30.0
1,2-Dibromoethane		<b>103.40</b>	70.3	133.7	<b>0.8</b>	30.0
Chlorobenzene		<b>103.16</b>	79.2	122.7	<b>0.3</b>	30.0
1,1,1,2-Tetrachloroethane		<b>116.86</b>	80.3	128.2	<b>3.2</b>	30.0
Ethylbenzene		<b>104.82</b>	79.5	129.1	<b>0.6</b>	30.0
p,m-Xylene		<b>104.04</b>	79.4	132.2	<b>0.5</b>	30.0
o-Xylene		<b>107.26</b>	80.2	131.0	<b>2.7</b>	30.0
Styrene		<b>109.96</b>	69.5	126.7	<b>2.5</b>	30.0
Isopropylbenzene		<b>107.32</b>	74.4	121.5	<b>1.6</b>	30.0
Bromoform		<b>111.10</b>	69.4	128.0	<b>0.3</b>	30.0
1,1,2,2-Tetrachloroethane		<b>104.06</b>	79.8	126.3	<b>3.1</b>	30.0
1,2,3-Trichloropropane		<b>103.22</b>	78.3	138.8	<b>5.6</b>	30.0
n-Propylbenzene		<b>104.56</b>	82.0	130.7	<b>0.7</b>	30.0
Bromobenzene		<b>103.58</b>	78.7	124.6	<b>2.0</b>	30.0
1,3,5-Trimethylbenzene		<b>106.92</b>	81.3	128.9	<b>0.5</b>	30.0

## QC Report - Batch QC Results

### Organics - Volatiles, Prep Batch ID: VF141007W1 (continued)

Surrogates: Yes, QC Types: LCS/BLK/LCSD

### Laboratory Control Sample Duplicate (LCSD) (continued)

Lab Sample ID: 141007a7.lcsw07b, Parent Sample ID: 141007a7.lcsw07a

Run in Batch: 141007A7, Run Date: 10/07/2014 12:52, Prep Date: 10/07/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL	RPD	RPD CL
tert-Butylbenzene		<b>105.96</b>	80.7	128.9	<b>2.7</b>	30.0
1,2,4-Trimethylbenzene		<b>107.36</b>	81.4	130.8	<b>1.2</b>	30.0
sec-Butylbenzene		<b>106.46</b>	77.4	129.8	<b>0.1</b>	30.0
p-Isopropyltoluene		<b>105.84</b>	79.8	137.5	<b>0.2</b>	30.0
1,3-Dichlorobenzene		<b>102.60</b>	77.0	131.3	<b>2.0</b>	30.0
1,4-Dichlorobenzene		<b>101.46</b>	20.7	137.7	<b>1.0</b>	30.0
1,2-Dichlorobenzene		<b>102.88</b>	10.0	166.2	<b>0.5</b>	30.0
1,2,3-Trimethylbenzene		<b>104.20</b>	76.3	124.2	<b>0.6</b>	30.0
n-Butylbenzene		<b>104.58</b>	80.0	133.3	<b>1.5</b>	30.0
Hexachloroethane		<b>119.50</b>	23.8	138.1	<b>2.9</b>	30.0
1,2-Dibromo-3-Chloropropane		<b>113.92</b>	21.2	189.4	<b>6.7</b>	30.0
1,2,4-Trichlorobenzene		<b>115.86</b>	27.4	143.4	<b>2.9</b>	30.0
1,2,3-Trichlorobenzene		<b>115.94</b>	75.4	131.4	<b>5.4</b>	30.0
Naphthalene		<b>116.52</b>	32.9	135.8	<b>7.9</b>	30.0
2-Methylnaphthalene		<b>123.96</b>	25.5	165.5	<b>10.6</b>	30.0

## QC Report - Batch QC Results

### Organics - Volatiles, Prep Batch ID: VS141013W1

Surrogates: Yes, QC Types: LCS/BLK/LCSD

#### Laboratory Control Sample (LCS)

Lab Sample ID: 141013a6.lcsw13a

Run in Batch: 141013A6, Run Date: 10/13/2014 12:52, Prep Date: 10/13/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL
1,4-Dioxane		85.32	70.0	130.0

#### Blank (BLK)

Lab Sample ID: 141013a6.blkw13a

Run in Batch: 141013A6, Run Date: 10/13/2014 13:48, Prep Date: 10/13/2014, Matrix: WW, Dilution: 1

Analyte	Flags	Conc	RDL	Units
1,4-Dioxane	*	1.2	0.02	ug/l

#### Laboratory Control Sample Duplicate (LCSD)

Lab Sample ID: 141013a6.lcsw13b, Parent Sample ID: 141013a6.lcsw13a

Run in Batch: 141013A6, Run Date: 10/13/2014 13:11, Prep Date: 10/13/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL	RPD	RPD CL
1,4-Dioxane		88.96	70.0	130.0	4.2	30.0

## QC Report - Batch QC Results

### Organics - Volatiles, Prep Batch ID: VS141014W2

Surrogates: Yes, QC Types: LCS/BLK/LCSD

#### Laboratory Control Sample (LCS)

Lab Sample ID: 141014b6.lcsw14a

Run in Batch: 141014B6, Run Date: 10/14/2014 14:29, Prep Date: 10/14/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL
1,2-dibromoethane		<b>120.00</b>	70.0	130.0
1,2-dibromo-3-chloropropane		<b>120.00</b>	70.0	130.0
1,4-dioxane		<b>92.74</b>	70.0	130.0
Dibromomethane		<b>120.00</b>	70.0	130.0

#### Blank (BLK)

Lab Sample ID: 141014b6.blkw14a

Run in Batch: 141014B6, Run Date: 10/14/2014 15:23, Prep Date: 10/14/2014, Matrix: WW, Dilution: 1

Analyte	Flags	Conc	RDL	Units
1,4-Dioxane	*	<b>0.9</b>	0.02	ug/l

#### Laboratory Control Sample Duplicate (LCSD)

Lab Sample ID: 141014b6.lcsw14b, Parent Sample ID: 141014b6.lcsw14a

Run in Batch: 141014B6, Run Date: 10/14/2014 14:47, Prep Date: 10/14/2014, Matrix: WW, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL	RPD	RPD CL
1,2-dibromoethane		<b>120.00</b>	70.0	130.0	<b>0.0</b>	30.0
1,2-dibromo-3-chloropropane		<b>130.00</b>	70.0	130.0	<b>8.0</b>	30.0
1,4-dioxane		<b>102.30</b>	70.0	130.0	<b>9.8</b>	30.0
Dibromomethane		<b>110.00</b>	70.0	130.0	<b>8.7</b>	30.0





# Analytical Laboratory Report

Report ID: S62825.01(01)  
Generated on 09/30/2014

Report to

---

Attention: Randy Christensen  
Arcadis  
10559 Citation Drive  
Suite 100  
Brighton, MI 48116

Phone: 810-225-1940 FAX: 810-229-8837  
Email: Randy.Christensen@arcadis-us.com

Additional Contacts: Cordelia Swegal, Kristen Templin

Report produced by

---

Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
Kevin George (kgeorge@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

---

Lab Sample ID(s): S62825.01  
Project: Lansing Plant 3 B0064480.2014  
Collected Date: 09/18/2014  
Submitted Date/Time: 09/19/2014 09:30  
Sampled by: Billy J. Coben  
P.O. #: B0064480.2014

A handwritten signature in cursive script that reads "Maya Murshak".

Maya Murshak  
Technical Director



# Analytical Laboratory Report

## **General Report Notes**

---

Results relate only to items tested as received by laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis were applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

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Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

## **Report Narrative**

---

There is no additional narrative for this analytical report



# Analytical Laboratory Report

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods



# Analytical Laboratory Report

## Method Summary

Method	Version
N/A	Not Applicable
SW3015A	SW 846 Method 3015A Revision 1 February 2007
SW6020A	SW 846 Method 6020A Revision 1 February 2007
SW8260B - SIM	SW 846 Method 8260B Revision 2 December 1996 SIMs



# Analytical Laboratory Report

## Sample Summary (1 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S62825.01	PW-14-03_091814	Groundwater	09/18/2014 10:10



# Analytical Laboratory Report

Lab Sample ID: S62825.01  
 Sample Tag: PW-14-03\_091814  
 Collected Date/Time: 09/18/2014 10:10  
 Matrix: Groundwater  
 COC Reference: 87100

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
3	40ml Glass	HCL	Yes	5.2	IR
1	125ml Plastic	HNO3	Yes	5.2	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	09/29/14 09:30	JRH		
pH check for VOCs	<2	STD Units		N/A	09/24/14 12:30	LBR		
<b>Metals</b>								
Iron	0.54	mg/L	0.02	SW6020A	09/29/14 10:56	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	77	ug/L	5	SW8260B - SIM	09/24/14 15:13	WAT	123-91-1	



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

87100

**REPORT TO** Randy Christensen **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME **ARCADIS**  
 COMPANY **10559 Citiation Drive Suite 100**  
 ADDRESS **Brighton MI 48116**  
 CITY **810-225-1910** STATE ZIP CODE  
 PHONE NO. **randy.christensen@arcadis-us.com** P.O. NO.  
 E-MAIL ADDRESS **Lansing Plant 3 Project#: 80064482014.** QUOTE NO.

CONTACT NAME **ARCADIS**  SAME  
 COMPANY  
 ADDRESS  
 CITY STATE ZIP CODE  
 PHONE NO. E-MAIL ADDRESS

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME SAMPLER(S) - PLEASE PRINT/SIGN NAME  
Bruce J. Coburn / [Signature]  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	1,4 DIOXANE	TOTAL Fe
	DATE	TIME												
<u>62825.01</u>	<u>9/10/14</u>	<u>10:10</u>	<u>PN-14-03_091814</u>	<u>GW</u>	<u>4</u>		<u>XX</u>						<u>X</u>	<u>X</u>

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
 Special Instructions

RELINQUISHED BY: [Signature] / ARCADIS  Sampler DATE 9-18-14 TIME 17:30  
 RECEIVED BY: [Signature] DATE 9-18-14 TIME 1730  
 RELINQUISHED BY: [Signature] DATE 9-18-14 TIME 1900  
 RECEIVED BY: [Signature] DATE 9-18-14 TIME 1900

RELINQUISHED BY: [Signature] DATE 9-18-14 TIME 1900  
 RECEIVED BY: [Signature] DATE 9/19/14 TIME 930  
 SEAL NO. SEAL INTACT INITIALS NOTES: TEMP. ON ARRIVAL 52  
 YES  NO   
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



# Analytical Laboratory Report

Report ID: S62826.01(01)  
Generated on 10/01/2014

Report to

---

Attention: Randy Christensen  
Arcadis  
10559 Citation Drive  
Suite 100  
Brighton, MI 48116

Phone: 810-225-1940 FAX: 810-229-8837  
Email: Randy.Christensen@arcadis-us.com

Additional Contacts: Cordelia Swegal, Kristen Templin

Report produced by

---

Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
Kevin George (kgeorge@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

---

Lab Sample ID(s): S62826.01  
Project: Lansing Plant 2 B0064479.2014  
Collected Date: 09/18/2014  
Submitted Date/Time: 09/19/2014 09:30  
Sampled by: Billy J. Coben  
P.O. #: B0064479.2014

A handwritten signature in cursive script that reads "Maya Murshak".

Maya Murshak  
Technical Director



# Analytical Laboratory Report

## **General Report Notes**

---

Results relate only to items tested as received by laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis were applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request.

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## **Report Narrative**

---

There is no additional narrative for this analytical report



# Analytical Laboratory Report

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
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j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods



# Analytical Laboratory Report

## Method Summary

Method	Version
N/A	Not Applicable
SW3015A	SW 846 Method 3015A Revision 1 February 2007
SW6020A	SW 846 Method 6020A Revision 1 February 2007
SW8260B - SIM	SW 846 Method 8260B Revision 2 December 1996 SIMs



# Analytical Laboratory Report

## Sample Summary (1 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S62826.01	PW-14-02_091814	Groundwater	09/18/2014 17:10



# Analytical Laboratory Report

Lab Sample ID: S62826.01  
 Sample Tag: PW-14-02\_091814  
 Collected Date/Time: 09/18/2014 17:10  
 Matrix: Groundwater  
 COC Reference: 87103

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
3	40ml Glass	HCL	Yes	5.2	IR
2	125ml Plastic	HNO3	Yes	5.2	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	09/29/14 09:30	JRH		
Metal Digestion	Completed			SW3015A	09/29/14 09:30	JRH		
pH check for VOCs	<2	STD Units		N/A	09/24/14 12:30	LBR		
<b>Metals</b>								
Iron, Dissolved	2.33	mg/L	0.02	SW6020A	09/29/14 11:09	JRH	7439-89-6	
Iron	3.28	mg/L	0.02	SW6020A	09/29/14 11:07	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	440	ug/L	50	SW8260B - SIM	09/30/14 15:46	WAT	123-91-1	Y

Y-Elevated reporting limit due to high target concentration



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 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

87103

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Randy Christensen**  
 COMPANY **ARCADIS**  
 ADDRESS **10559 Citiation Drive Suite 100**  
 CITY **Brighton** STATE **MI** ZIP CODE **48116**  
 PHONE NO. **810-225-1910** FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS **randy.christensen@arcadis-us.com** QUOTE NO. \_\_\_\_\_

CONTACT NAME \_\_\_\_\_  SAME  
 COMPANY **ARCADIS**  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS \_\_\_\_\_

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Lansing Plant 2 Project#: 800644 T9 2014.** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Bruce J. Coburn**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER \_\_\_\_\_  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
 Special Instructions \_\_\_\_\_

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	1,4 Dioxane	Total Fe	Distillate Fe		
	DATE	TIME															
62826.01	9/16/14	17:10	PW-14-02_091814	GW	5		X	X					X	X	X		

RELINQUISHED BY: **[Signature]** ARCADIS **90** sampler DATE **9/18/14** TIME **17:30**  
 RECEIVED BY: **[Signature]** DATE **9/18/14** TIME **17:30**  
 RELINQUISHED BY: **[Signature]** DATE **9-18-14** TIME **19:00**  
 RECEIVED BY: **[Signature]** DATE **9-18-14** TIME **19:00**

RELINQUISHED BY: **[Signature]** DATE **9-19-14** TIME \_\_\_\_\_  
 RECEIVED BY: **[Signature]** DATE **9/19/14** TIME **9:30**  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_ NOTES: TEMP. ON ARRIVAL **52**  
 SEAL NO. SEAL INTACT YES  NO  INITIALS \_\_\_\_\_



# Analytical Laboratory Report

Report ID: S62846.01(01)  
Generated on 10/01/2014

Report to

---

Attention: Randy Christensen  
Arcadis  
10559 Citation Drive  
Suite 100  
Brighton, MI 48116

Phone: 810-225-1940 FAX: 810-229-8837  
Email: Randy.Christensen@arcadis-us.com

Additional Contacts: Cordelia Swegal, Kristen Templin

Report produced by

---

Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
Kevin George (kgeorge@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

---

Lab Sample ID(s): S62846.01-S62846.02  
Project: Lansing Plant 2 B0064479.2014  
Collected Date: 09/19/2014  
Submitted Date/Time: 09/19/2014 16:38  
Sampled by: Doug Spencer  
P.O. #: B0064479.2014

A handwritten signature in cursive script, reading "Maya Murshak".

Maya Murshak  
Technical Director



# Analytical Laboratory Report

## **General Report Notes**

---

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## **Report Narrative**

---

There is no additional narrative for this analytical report



# Analytical Laboratory Report

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702

## Qualifier Descriptions

Qualifier	Description
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B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
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j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods



# Analytical Laboratory Report

## Method Summary

Method	Version
N/A	Not Applicable
SW3015A	SW 846 Method 3015A Revision 1 February 2007
SW3510C	SW 846 Method 3510C Revision 3 December 1996
SW6020A	SW 846 Method 6020A Revision 1 February 2007
SW8260B	SW 846 Method 8260B Revision 2 December 1996
SW8260B - SIM	SW 846 Method 8260B Revision 2 December 1996 SIMs



# Analytical Laboratory Report

## Sample Summary (2 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S62846.01	PW-14-01_091914	Groundwater	09/19/2014 14:00
S62846.02	Trip Blank	Groundwater	09/19/2014 07:00



# Analytical Laboratory Report

Lab Sample ID: S62846.01  
 Sample Tag: PW-14-01\_091914  
 Collected Date/Time: 09/19/2014 14:00  
 Matrix: Groundwater  
 COC Reference: 71876

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
3	40ml Glass	HCL	Yes	14.2	IR
1	1L Amber	None	Yes	14.2	IR
1	125ml Plastic	HNO3	Yes	14.2	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
BNA Extraction	Completed			SW3510C	09/22/14 19:39	EMR		
Metal Digestion	Completed			SW3015A	09/29/14 09:30	JRH		
pH check for VOCs	<2	STD Units		N/A	09/24/14 16:35	LBR		
<b>Metals</b>								
Iron	0.10	mg/L	0.02	SW6020A	09/29/14 10:59	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	260	ug/L	30	SW8260B - SIM	09/30/14 15:28	WAT	123-91-1	Y

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Lab Sample ID: S62846.02  
 Sample Tag: Trip Blank  
 Collected Date/Time: 09/19/2014 07:00  
 Matrix: Groundwater  
 COC Reference: 71876

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	40ml Glass	HCL	Yes	14.2	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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**Extraction / Prep.**

pH check for VOCs	<2	STD Units		N/A	09/24/14 16:35	LBR		
-------------------	----	-----------	--	-----	----------------	-----	--	--

**Organics - Volatiles**

1,2-Dibromo-3-chloropropane	Not detected	ug/L	0.2	SW8260B - SIM	09/24/14 17:41	WAT	96-12-8	
1,2-Dibromoethane	Not detected	ug/L	0.05	SW8260B - SIM	09/24/14 17:41	WAT	106-93-4	
1,4-Dioxane	Not detected	ug/L	5	SW8260B - SIM	09/24/14 17:41	WAT	123-91-1	

**TCL Volatile Organics 8260**

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260B	09/29/14 19:04	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260B	09/29/14 19:04	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260B	09/29/14 19:04	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260B	09/29/14 19:04	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260B	09/29/14 19:04	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	108-88-3	
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	127-18-4	
Dibromochloromethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	124-48-1	



# Analytical Laboratory Report

Lab Sample ID: S62846.02 (continued)

Sample Tag: Trip Blank

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
Chlorobenzene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	108-90-7	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260B	09/29/14 19:04	WAT		
o-Xylene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260B	09/29/14 19:04	WAT	120-82-1	



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
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C.O.C. PAGE # 1 OF 1

71876

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME **Randy Christensen**  
 COMPANY **ARCADIS**  
 ADDRESS **10559 Citation Drive Suite 100**  
 CITY **Brighton** STATE **MI** ZIP CODE **48116**  
 PHONE NO. **810-225-1910** FAX NO. \_\_\_\_\_ P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS **randy.christensen@arcadis-us.com** QUOTE NO. \_\_\_\_\_

CONTACT NAME \_\_\_\_\_  SAME  
 COMPANY **Aracadin**  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS \_\_\_\_\_

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME **Lansing Plant 2 Project # B00644** SAMPLER(S) - PLEASE PRINT/SIGN NAME **Doug Spencer**  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER \_\_\_\_\_  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

**# Containers & Preservatives**

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	VOC's	Dioxane	SVOC's	TAL Metals (Total)
	DATE	TIME														
62846.01	9/19/14	1400	PW-14-01-04/914	GW	5	1	3	1					X	X	X	
.02	9/19/14	0700	Trip Blank	GW	3		3						X			

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
 Special Instructions \_\_\_\_\_

RELINQUISHED BY: **Doug Spencer** (PM Environmental)  Sampler DATE **9/19/14** TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: **Merim George** DATE **9/19/14** TIME **16:38**  
 SEAL NO. SEAL INTACT INITIALS NOTES: TEMP. ON ARRIVAL **14.2**  
 YES  NO   
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



# Analytical Laboratory Report

Report ID: S63010.01(01)  
Generated on 10/09/2014

Report to

---

Attention: Randy Christensen  
Arcadis  
28550 Cabot Drive  
Suite 500  
Novi, MI 48377

Phone: 810-225-1940 FAX: 248-994-2241  
Email: Randy.Christensen@arcadis-us.com

Additional Contacts: Cordelia Swegal, Kristen Templin

Report produced by

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Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
Kevin George (kgeorge@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

---

Lab Sample ID(s): S63010.01-S63010.06  
Project: B0064479.0014.00501 / RACER Lansing  
Collected Date: 09/30/2014 - 10/02/2014  
Submitted Date/Time: 10/02/2014 14:15  
Sampled by: Adam Richmond  
P.O. #: B0064479.0014.00501

Maya Murshak  
Technical Director



# Analytical Laboratory Report

## **General Report Notes**

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Results relate only to items tested as received by laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis were applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

## **Report Narrative**

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There is no additional narrative for this analytical report



# Analytical Laboratory Report

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods



# Analytical Laboratory Report

## Method Summary

Method	Version
N/A	Not Applicable
SW3015A	SW 846 Method 3015A Revision 1 February 2007
SW6020A	SW 846 Method 6020A Revision 1 February 2007
SW8260C	SW 846 Method 8260C Revision 3 August 2006



# Analytical Laboratory Report

## Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S63010.01	PW-14-02(093014)Begin	Liquid	09/30/2014 05:50
S63010.02	PW-14-02(093014)Begin-2	Liquid	09/30/2014 10:00
S63010.03	PW-14-02(093014)Begin-3	Liquid	09/30/2014 16:30
S63010.04	PW-14-02(100114)Mid	Liquid	10/01/2014 16:30
S63010.05	PW-14-02(100214)36H	Liquid	10/02/2014 04:30
S63010.06	Source Water(100214)	Liquid	10/02/2014 14:00



# Analytical Laboratory Report

Lab Sample ID: S63010.01  
 Sample Tag: PW-14-02(093014)Begin  
 Collected Date/Time: 09/30/2014 05:50  
 Matrix: Liquid  
 COC Reference: 87204

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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**Extraction / Prep.**

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

**Metals**

Iron	54.9	mg/L	0.02	SW6020A	10/09/14 12:52	JRH	7439-89-6	
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**Organics - Volatiles**

**TCL Volatile Organics 8260**

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	108-88-3	
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	127-18-4	



# Analytical Laboratory Report

Lab Sample ID: S63010.01 (continued)

Sample Tag: PW-14-02(093014)Begin

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 16:56	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	120-82-1	



# Analytical Laboratory Report

Lab Sample ID: S63010.02  
 Sample Tag: PW-14-02(093014)Begin-2  
 Collected Date/Time: 09/30/2014 10:00  
 Matrix: Liquid  
 COC Reference: 87204

## Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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### Extraction / Prep.

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

### Metals

Iron	10.1	mg/L	0.02	SW6020A	10/09/14 12:49	JRH	7439-89-6	
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### Organics - Volatiles

#### TCL Volatile Organics 8260

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	108-88-3	
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	127-18-4	



# Analytical Laboratory Report

Lab Sample ID: S63010.02 (continued)  
Sample Tag: PW-14-02(093014)Begin-2

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 17:18	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	120-82-1	



# Analytical Laboratory Report

Lab Sample ID: S63010.03  
Sample Tag: PW-14-02(093014)Begin-3  
Collected Date/Time: 09/30/2014 16:30  
Matrix: Liquid  
COC Reference: 87204

## Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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### Extraction / Prep.

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

### Metals

Iron	3.03	mg/L	0.02	SW6020A	10/09/14 12:54	JRH	7439-89-6	
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### Organics - Volatiles

#### TCL Volatile Organics 8260

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	108-88-3	
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	127-18-4	



# Analytical Laboratory Report

Lab Sample ID: S63010.03 (continued)  
Sample Tag: PW-14-02(093014)Begin-3

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 17:40	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	120-82-1	



# Analytical Laboratory Report

Lab Sample ID: S63010.04  
Sample Tag: PW-14-02(100114)Mid  
Collected Date/Time: 10/01/2014 16:30  
Matrix: Liquid  
COC Reference: 87204

## Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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### Extraction / Prep.

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

### Metals

Iron	2.33	mg/L	0.02	SW6020A	10/09/14 12:56	JRH	7439-89-6	
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### Organics - Volatiles

#### TCL Volatile Organics 8260

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	108-88-3	
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	127-18-4	



# Analytical Laboratory Report

Lab Sample ID: S63010.04 (continued)

Sample Tag: PW-14-02(100114)Mid

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 18:02	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	120-82-1	



# Analytical Laboratory Report

Lab Sample ID: S63010.05  
 Sample Tag: PW-14-02(100214)36H  
 Collected Date/Time: 10/02/2014 04:30  
 Matrix: Liquid  
 COC Reference: 87204

## Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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### Extraction / Prep.

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

### Metals

Iron	2.30	mg/L	0.02	SW6020A	10/09/14 13:00	JRH	7439-89-6	
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### Organics - Volatiles

#### TCL Volatile Organics 8260

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	108-88-3	
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	127-18-4	



# Analytical Laboratory Report

Lab Sample ID: S63010.05 (continued)

Sample Tag: PW-14-02(100214)36H

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 18:24	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	120-82-1	



# Analytical Laboratory Report

Lab Sample ID: S63010.06  
 Sample Tag: Source Water(100214)  
 Collected Date/Time: 10/02/2014 14:00  
 Matrix: Liquid  
 COC Reference: 87204

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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**Extraction / Prep.**

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

**Metals**

Iron	1.78	mg/L	0.02	SW6020A	10/09/14 12:58	JRH	7439-89-6	
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**Organics - Volatiles**

**TCL Volatile Organics 8260**

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	156-59-2	
Chloroform	3	ug/L	1	SW8260C	10/07/14 18:46	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	78-87-5	
Bromodichloromethane	1	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	108-88-3	
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	127-18-4	



# Analytical Laboratory Report

Lab Sample ID: S63010.06 (continued)

Sample Tag: Source Water(100214)

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 18:46	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	120-82-1	



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 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

87204

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME Randy Christensen  
 COMPANY ARCADIS  
 ADDRESS 28550 Cabot dr. Suite 500  
 CITY Novi MI STATE MI ZIP CODE 48377  
 PHONE NO. (248) 994 2240 FAX NO. (248) 994-2241 P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS randy.christensen@arcadis-us.com QUOTE NO. \_\_\_\_\_

CONTACT NAME SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS \_\_\_\_\_

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME B0064479.0014.00501/RACER Lansing SAMPLER(S) - PLEASE PRINT/SIGN NAME Alan Richmond  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER \_\_\_\_\_  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

**# Containers & Preservatives**

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	VOCs	Total From G020
	DATE	TIME												
<u>03010:01</u>	<u>9/30/14</u>	<u>0550</u>	<u>PW-14-02(093014) Begin</u>		<u>4</u>		<u>✓</u>	<u>✓</u>					<u>✓</u>	<u>✓</u>
<del>02</del>	<del>9/30/14</del>	<del>0550</del>	<del>PW-14-02(093014) Begin-2</del>		<del>4</del>									
<u>.02</u>	<u>9/30/14</u>	<u>1000</u>	<u>PW-14-02(093014) Begin-2</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>
<u>.03</u>	<u>9/30/14</u>	<u>1630</u>	<u>PW-14-02(093014) Begin-3</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>
<u>.04</u>	<u>10/1/14</u>	<u>1630</u>	<u>PW-14-02(100114) Mid</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>
<u>.05</u>	<u>10/1/14</u>	<u>0430</u>	<u>PW-14-02(100214) 36H</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>
<u>.06</u>	<u>10/2/14</u>	<u>1400</u>	<u>Source Water (100214)</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>

**Certifications**

OHIO VAP  Drinking Water

DoD  NPDES

**Project Locations**

Detroit  New York

Other \_\_\_\_\_

**Special Instructions**

RELINQUISHED BY: [Signature] / ARCADIS  Sampler DATE 10/2/14 TIME 1415  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: [Signature] DATE 10/2/14 TIME 1415  
 SEAL NO. SEAL INTACT INITIALS NOTES: TEMP. ON ARRIVAL 5.0  
 YES  NO   
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO



# Analytical Laboratory Report

Supplemental Report

Report ID: S63010.01(02)  
Generated on 10/15/2014  
Replaces report S63010.01(01) generated on 10/09/2014

Report to

Attention: Randy Christensen  
Arcadis  
28550 Cabot Drive  
Suite 500  
Novi, MI 48377

Phone: 810-225-1940 FAX: 248-994-2241  
Email: Randy.Christensen@arcadis-us.com

Additional Contacts: Cordelia Swegal, Kristen Templin

Report produced by

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Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
Kevin George (kgeorge@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S63010.01-S63010.06  
Project: B0064479.0014.00501 / RACER Lansing  
Collected Date: 09/30/2014 - 10/02/2014  
Submitted Date/Time: 10/02/2014 14:15  
Sampled by: Adam Richmond  
P.O. #: B0064479.0014.00501

Maya Murshak  
Technical Director



# Analytical Laboratory Report

Supplemental Report

## General Report Notes

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Results relate only to items tested as received by laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis were applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

## Report Narrative

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1,4-Dioxane added per client request.



# Analytical Laboratory Report

Supplemental Report

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods



# Analytical Laboratory Report

Supplemental Report

## Method Summary

Method	Version
N/A	Not Applicable
SW3015A	SW 846 Method 3015A Revision 1 February 2007
SW6020A	SW 846 Method 6020A Revision 1 February 2007
SW8260B - SIM	SW 846 Method 8260B Revision 2 December 1996 SIMs
SW8260C	SW 846 Method 8260C Revision 3 August 2006



# Analytical Laboratory Report

Supplemental Report

## Sample Summary (6 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S63010.01	PW-14-02(093014)Begin	Liquid	09/30/2014 05:50
S63010.02	PW-14-02(093014)Begin-2	Liquid	09/30/2014 10:00
S63010.03	PW-14-02(093014)Begin-3	Liquid	09/30/2014 16:30
S63010.04	PW-14-02(100114)Mid	Liquid	10/01/2014 16:30
S63010.05	PW-14-02(100214)36H	Liquid	10/02/2014 04:30
S63010.06	Source Water(100214)	Liquid	10/02/2014 14:00



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.01  
 Sample Tag: PW-14-02(093014)Begin  
 Collected Date/Time: 09/30/2014 05:50  
 Matrix: Liquid  
 COC Reference: 87204

### Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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### Extraction / Prep.

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

### Metals

Iron	54.9	mg/L	0.02	SW6020A	10/09/14 12:52	JRH	7439-89-6	
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### Organics - Volatiles

1,4-Dioxane	460	ug/L	50	SW8260B - SIM	10/13/14 17:41	JGH	123-91-1	Y
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### TCL Volatile Organics 8260

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 16:56	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	108-88-3	

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.01 (continued)

Sample Tag: PW-14-02(093014)Begin

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	127-18-4	
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	108-90-7	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 16:56	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 16:56	WAT	120-82-1	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.02  
 Sample Tag: PW-14-02(093014)Begin-2  
 Collected Date/Time: 09/30/2014 10:00  
 Matrix: Liquid  
 COC Reference: 87204

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		
<b>Metals</b>								
Iron	10.1	mg/L	0.02	SW6020A	10/09/14 12:49	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	390	ug/L	50	SW8260B - SIM	10/13/14 17:59	JGH	123-91-1	Y
<b>TCL Volatile Organics 8260</b>								
1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 17:18	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	108-88-3	

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.02 (continued)  
Sample Tag: PW-14-02(093014)Begin-2

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	127-18-4	
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	108-90-7	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 17:18	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:18	WAT	120-82-1	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.03  
Sample Tag: PW-14-02(093014)Begin-3  
Collected Date/Time: 09/30/2014 16:30  
Matrix: Liquid  
COC Reference: 87204

## Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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### Extraction / Prep.

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

### Metals

Iron	3.03	mg/L	0.02	SW6020A	10/09/14 12:54	JRH	7439-89-6	
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### Organics - Volatiles

1,4-Dioxane	380	ug/L	50	SW8260B - SIM	10/13/14 18:18	JGH	123-91-1	Y
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### TCL Volatile Organics 8260

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 17:40	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	108-88-3	

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.03 (continued)  
Sample Tag: PW-14-02(093014)Begin-3

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	127-18-4	
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 17:40	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 17:40	WAT	120-82-1	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.04  
 Sample Tag: PW-14-02(100114)Mid  
 Collected Date/Time: 10/01/2014 16:30  
 Matrix: Liquid  
 COC Reference: 87204

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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**Extraction / Prep.**

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

**Metals**

Iron	2.33	mg/L	0.02	SW6020A	10/09/14 12:56	JRH	7439-89-6	
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**Organics - Volatiles**

1,4-Dioxane	380	ug/L	50	SW8260B - SIM	10/14/14 21:32	JGH	123-91-1	Y
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**TCL Volatile Organics 8260**

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 18:02	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	108-88-3	

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.04 (continued)

Sample Tag: PW-14-02(100114)Mid

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	127-18-4	
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 18:02	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:02	WAT	120-82-1	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.05  
 Sample Tag: PW-14-02(100214)36H  
 Collected Date/Time: 10/02/2014 04:30  
 Matrix: Liquid  
 COC Reference: 87204

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
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**Extraction / Prep.**

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

**Metals**

Iron	2.30	mg/L	0.02	SW6020A	10/09/14 13:00	JRH	7439-89-6	
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**Organics - Volatiles**

1,4-Dioxane	330	ug/L	50	SW8260B - SIM	10/13/14 18:55	JGH	123-91-1	Y
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**TCL Volatile Organics 8260**

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	156-59-2	
Chloroform	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 18:24	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	78-87-5	
Bromodichloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	108-88-3	

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.05 (continued)

Sample Tag: PW-14-02(100214)36H

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	10061-02-6	
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	127-18-4	
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	108-90-7	
1,1,2,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 18:24	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:24	WAT	120-82-1	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.06  
 Sample Tag: Source Water(100214)  
 Collected Date/Time: 10/02/2014 14:00  
 Matrix: Liquid  
 COC Reference: 87204

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.0	IR
3	40ml Glass	HCL	Yes	5.0	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
----------	---------	-------	----	--------	---------------	---------	-------	-------

**Extraction / Prep.**

Metal Digestion	Completed			SW3015A	10/09/14 11:45	JRH		
pH check for VOCs	<2	STD Units		N/A	10/08/14 10:48	LBR		

**Metals**

Iron	1.78	mg/L	0.02	SW6020A	10/09/14 12:58	JRH	7439-89-6	
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**Organics - Volatiles**

1,4-Dioxane	Not detected	ug/L	5	SW8260B - SIM	10/13/14 15:37	JGH	123-91-1	
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**TCL Volatile Organics 8260**

1,1,2-Trichloro-1,2,2-trifluoroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	76-13-1	
Acetone	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	67-64-1	
Carbon disulfide	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-15-0	
Methyl Acetate	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	79-20-9	
tert-Methyl butyl ether (MTBE)	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	1634-04-4	
2-Butanone (MEK)	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	78-93-3	
Dichlorodifluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-71-8	
Chloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	74-87-3	
Vinyl chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-01-4	
Bromomethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	74-83-9	
Chloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-00-3	
Trichlorofluoromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-69-4	
1,1-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-35-4	
Methylene chloride	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-09-2	
trans-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	156-60-5	
1,1-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-34-3	
cis-1,2-Dichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	156-59-2	
Chloroform	3	ug/L	1	SW8260C	10/07/14 18:46	WAT	67-66-3	
1,1,1-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	71-55-6	
Cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	110-82-7	
4-Methyl-2-pentanone (MIBK)	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	108-10-1	
2-Hexanone	Not detected	ug/L	10	SW8260C	10/07/14 18:46	WAT	591-78-6	
Carbon tetrachloride	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	56-23-5	
Benzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	71-43-2	
1,2-Dichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	107-06-2	
Trichloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	79-01-6	
1,2-Dichloropropane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	78-87-5	
Bromodichloromethane	1	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-27-4	
Methyl cyclohexane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	108-87-2	
cis-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	10061-01-5	
Toluene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	108-88-3	
trans-1,3-Dichloropropene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	10061-02-6	



# Analytical Laboratory Report

Supplemental Report

Lab Sample ID: S63010.06 (continued)

Sample Tag: Source Water(100214)

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Organics - Volatiles (continued)</b>								
<b>TCL Volatile Organics 8260 (continued)</b>								
1,1,2-Trichloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	79-00-5	
Tetrachloroethene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	127-18-4	
Dibromochloromethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	124-48-1	
Chlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	108-90-7	
1,1,1,2-Tetrachloroethane	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	79-34-5	
Ethylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	100-41-4	
p,m-Xylene	Not detected	ug/L	2	SW8260C	10/07/14 18:46	WAT		
o-Xylene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	95-47-6	
Styrene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	100-42-5	
Isopropylbenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	98-82-8	
Bromoform	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	75-25-2	
1,3-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	541-73-1	
1,4-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	106-46-7	
1,2-Dichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	95-50-1	
1,2,4-Trichlorobenzene	Not detected	ug/L	1	SW8260C	10/07/14 18:46	WAT	120-82-1	



2680 East Lansing Dr., East Lansing, MI 48823  
 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

87204

**REPORT TO**

**CHAIN OF CUSTODY RECORD**

**INVOICE TO**

CONTACT NAME Randy Christensen  
 COMPANY ARCADIS  
 ADDRESS 28550 Cabot dr. Suite 500  
 CITY Novi MI STATE MI ZIP CODE 48377  
 PHONE NO. (248) 994 2240 FAX NO. (248) 994-2241 P.O. NO. \_\_\_\_\_  
 E-MAIL ADDRESS randy.christensen@arcadis-us.com QUOTE NO. \_\_\_\_\_

CONTACT NAME SAME  
 COMPANY \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP CODE \_\_\_\_\_  
 PHONE NO. \_\_\_\_\_ E-MAIL ADDRESS \_\_\_\_\_

**ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)**

PROJECT NO./NAME B0064479.0014.00501/RACER Lansing SAMPLER(S) - PLEASE PRINT/SIGN NAME Alan Richmond  
 TURNAROUND TIME REQUIRED  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER \_\_\_\_\_  
 DELIVERABLES REQUIRED  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER \_\_\_\_\_

MATRIX GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 CODE: SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE

**# Containers & Preservatives**

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	VOCs	Total From G20
	DATE	TIME												
<u>01</u>	<u>9/30/14</u>	<u>0550</u>	<u>PW-14-02(093014) Begin</u>		<u>4</u>		<u>✓</u>	<u>✓</u>					<u>✓</u>	<u>✓</u>
<u>02</u>	<u>9/30/14</u>	<u>1000</u>	<u>PW-14-02(093014) Begin-2</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>
<u>03</u>	<u>9/30/14</u>	<u>1630</u>	<u>PW-14-02(093014) Begin-3</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>
<u>04</u>	<u>10/1/14</u>	<u>1630</u>	<u>PW-14-02(100114) Mid</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>
<u>05</u>	<u>10/1/14</u>	<u>0430</u>	<u>PW-14-02(100214) 36H</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>
<u>06</u>	<u>10/2/14</u>	<u>1400</u>	<u>Source Water (100214)</u>		<u>4</u>		<u>3</u>	<u>1</u>					<u>✓</u>	<u>✓</u>

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other \_\_\_\_\_  
 Special Instructions \_\_\_\_\_

RELINQUISHED BY: [Signature] / ARCADIS  Sampler DATE 10/2/14 TIME 1415  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE \_\_\_\_\_ TIME \_\_\_\_\_  
 RECEIVED BY: [Signature] DATE 10/2/14 TIME 1415  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 SEAL NO. \_\_\_\_\_ SEAL INTACT YES  NO  INITIALS \_\_\_\_\_  
 NOTES: \_\_\_\_\_ TEMP. ON ARRIVAL 5.0

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



# Analytical Laboratory Report

Report ID: S63141.01(01)  
Generated on 10/15/2014

Report to

---

Attention: Andrea Krevinghaus  
Arcadis  
28550 Cabot Drive  
Suite 500  
Novi, MI 48377

Phone: 810-841-1474 (Cell) FAX: 248-994-2241  
Email: andrea.krevinghaus@arcadis-us.com

Report produced by

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Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
Kevin George (kgeorge@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

---

Lab Sample ID(s): S63141.01-S63141.03  
Project: B0064478.14.501 / RACER, Lansing MI  
Collected Date: 10/09/2014 - 10/10/2014  
Submitted Date/Time: 10/10/2014 16:15  
Sampled by: Dustin Swarouth  
P.O. #: B0064478.14.501

A handwritten signature in cursive script that reads "Maya Murshak".

Maya Murshak  
Technical Director



# Analytical Laboratory Report

## **General Report Notes**

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Results relate only to items tested as received by laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis were applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

## **Report Narrative**

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There is no additional narrative for this analytical report



# Analytical Laboratory Report

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods



# Analytical Laboratory Report

## Method Summary

Method	Version
N/A	Not Applicable
SW3015A	SW 846 Method 3015A Revision 1 February 2007
SW6020A	SW 846 Method 6020A Revision 1 February 2007
SW8260B - SIM	SW 846 Method 8260B Revision 2 December 1996 SIMs



# Analytical Laboratory Report

## Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S63141.01	PW-14-01(100914)Mid	Groundwater	10/09/2014 20:36
S63141.02	PW-14-01(100914)End	Groundwater	10/09/2014 23:15
S63141.03	PW-14-01(101014)End-2	Groundwater	10/10/2014 00:52



# Analytical Laboratory Report

Lab Sample ID: S63141.01  
Sample Tag: PW-14-01(100914)Mid  
Collected Date/Time: 10/09/2014 20:36  
Matrix: Groundwater  
COC Reference:

## Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.3	IR
3	40ml Glass	HCL	Yes	5.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	10/14/14 11:00	JRH		
pH check for VOCs	<2	STD Units		N/A	10/13/14 12:40	LBR		
<b>Metals</b>								
Iron	5.24	mg/L	0.02	SW6020A	10/14/14 15:16	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	560	ug/L	50	SW8260B - SIM	10/13/14 19:13	JGH	123-91-1	Y

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Lab Sample ID: S63141.02  
 Sample Tag: PW-14-01(100914)End  
 Collected Date/Time: 10/09/2014 23:15  
 Matrix: Groundwater  
 COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.3	IR
3	40ml Glass	HCL	Yes	5.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	10/14/14 11:00	JRH		
pH check for VOCs	<2	STD Units		N/A	10/13/14 12:40	LBR		
<b>Metals</b>								
Iron	4.96	mg/L	0.02	SW6020A	10/14/14 15:20	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	530	ug/L	50	SW8260B - SIM	10/13/14 19:32	JGH	123-91-1	Y

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Lab Sample ID: S63141.03  
 Sample Tag: PW-14-01(101014)End-2  
 Collected Date/Time: 10/10/2014 00:52  
 Matrix: Groundwater  
 COC Reference:

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	5.3	IR
3	40ml Glass	HCL	Yes	5.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	10/14/14 11:00	JRH		
pH check for VOCs	<2	STD Units		N/A	10/13/14 13:00	LBR		
<b>Metals</b>								
Iron	5.12	mg/L	0.02	SW6020A	10/14/14 15:23	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	570	ug/L	50	SW8260B - SIM	10/13/14 19:50	JGH	123-91-1	Y

Y-Elevated reporting limit due to high target concentration

ID#: \_\_\_\_\_

**CHAIN OF CUSTODY & LABORATORY ANALYSIS REQUEST FORM**

Lab Work Order # \_\_\_\_\_

Send Results to:	Contact & Company Name:	Telephone:	Preservative	HCL(B) C					
	Address:	Fax:	Filtered (✓)						
	City	State	Zip	E-mail Address:	# of Containers	9	3		
	E-mail Address:				Container Information	1	3		

- Keys**
- Preservation Key:**  
 A. H<sub>2</sub>SO<sub>4</sub>  
 B. HCL  
 C. HNO<sub>3</sub>  
 D. NaOH  
 E. None  
 F. Other: \_\_\_\_\_
- Container Information Key:**  
 1. 40 ml Vial  
 2. 1 L Amber  
 3. 250 ml Plastic  
 4. 500 ml Plastic  
 5. Encore  
 6. 2 oz. Glass  
 7. 4 oz. Glass  
 8. 8 oz. Glass  
 9. Other: \_\_\_\_\_  
 10. Other: \_\_\_\_\_
- Matrix Key:**  
 SO - Soil  
 W - Water  
 T - Tissue  
 SE - Sediment  
 SL - Sludge  
 A - Air  
 NL - NAPL/Oil  
 SW - Sample Wipe  
 Other: \_\_\_\_\_

Project Name/Location (City, State):	Project #:	PARAMETER ANALYSIS & METHOD
Sampler's Printed Name:	Sampler's Signature:	

Sample ID	Collection		Type (✓)		Matrix	14 Dioxane Sims	Sediment Analysis	TOTAL IRON	6020	REMARKS
	Date	Time	Comp	Grab						
6341 .01 PW-14-01(100914) mid	10/9/14	2036		✓	GW	3	1			
.02 PW-14-01(100914) End	10/9/14	2315		✓	GW	3	1			
.03 PW-14-01(101014) End-2	10/10/14	0052		✓	GW	3	1			

Special Instructions/Comments: \_\_\_\_\_  Special QA/QC Instructions(✓): \_\_\_\_\_

Laboratory Information and Receipt		Relinquished By	Received By	Relinquished By	Laboratory Received By
Lab Name:	Cooler Custody Seal (✓)	Printed Name:	Printed Name:	Printed Name:	Printed Name:
<input type="checkbox"/> Cooler packed with ice (✓)	<input type="checkbox"/> Intact <input type="checkbox"/> Not Intact	Signature:	Signature:	Signature:	Signature:
Specify Turnaround Requirements:	Sample Receipt:	Firm:	Firm/Courier:	Firm/Courier:	Firm:
Shipping Tracking #:	Condition/Cooler Temp: <u>53</u>	Date/Time:	Date/Time:	Date/Time:	Date/Time:



# Analytical Laboratory Report

Report ID: S63217.01(01)  
Generated on 10/27/2014

Report to

---

Attention: Andrea Krevinghaus  
Arcadis  
28550 Cabot Drive  
Suite 500  
Novi, MI 48377

Phone: 810-841-1474 (Cell) FAX: 248-994-2241  
Email: andrea.krevinghaus@arcadis-us.com

Report produced by

---

Merit Laboratories, Inc.  
2680 East Lansing Drive  
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:  
Kevin George (kgeorge@meritlabs.com)  
Barbara Ball (bball@meritlabs.com)

Report Summary

---

Lab Sample ID(s): S63217.01-S63217.03  
Project: B0064479.0014.00501 / RACER Lansing  
Collected Date: 10/14/2014 - 10/16/2014  
Submitted Date/Time: 10/16/2014 16:55  
Sampled by: Adam Richmond  
P.O. #: B0064479.0014.00501

A handwritten signature in cursive script that reads "Maya Murshak".

Maya Murshak  
Technical Director



# Analytical Laboratory Report

## **General Report Notes**

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Results relate only to items tested as received by laboratory.

Methods may be modified for improved performance.

Results reported on a dry weight basis were applicable.

'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).

40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.

QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.

Full accreditation certificates are available upon request.

Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.

Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.

## **Report Narrative**

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There is no additional narrative for this analytical report



# Analytical Laboratory Report

## Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702

## Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

## Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods



# Analytical Laboratory Report

## Method Summary

Method	Version
N/A	Not Applicable
SW3015A	SW 846 Method 3015A Revision 1 February 2007
SW6020A	SW 846 Method 6020A Revision 1 February 2007
SW8260B - SIM	SW 846 Method 8260B Revision 2 December 1996 SIMs



# Analytical Laboratory Report

## Sample Summary (3 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S63217.01	PW-14-03(101414)Begin	Groundwater	10/14/2014 12:20
S63217.02	PW-14-03(101514)Mid	Groundwater	10/15/2014 13:30
S63217.03	PW-14-03(101614)End	Groundwater	10/16/2014 08:30



# Analytical Laboratory Report

Lab Sample ID: S63217.01  
Sample Tag: PW-14-03(101414)Begin  
Collected Date/Time: 10/14/2014 12:20  
Matrix: Groundwater  
COC Reference: 87201

## Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	12.3	IR
3	40ml Glass	HCL	Yes	12.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	10/22/14 09:30	JRH		
pH check for VOCs	<2	STD Units		N/A	10/24/14 10:10	WAT		
<b>Metals</b>								
Iron	19.5	mg/L	0.02	SW6020A	10/22/14 10:55	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	400	ug/L	50	SW8260B - SIM	10/23/14 15:10	WAT	123-91-1	Y

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Lab Sample ID: S63217.02  
 Sample Tag: PW-14-03(101514)Mid  
 Collected Date/Time: 10/15/2014 13:30  
 Matrix: Groundwater  
 COC Reference: 87201

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	12.3	IR
3	40ml Glass	HCL	Yes	12.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	10/22/14 09:30	JRH		
pH check for VOCs	<2	STD Units		N/A	10/24/14 10:10	WAT		
<b>Metals</b>								
Iron	19.7	mg/L	0.02	SW6020A	10/22/14 10:57	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	370	ug/L	50	SW8260B - SIM	10/23/14 15:29	WAT	123-91-1	Y

Y-Elevated reporting limit due to high target concentration



# Analytical Laboratory Report

Lab Sample ID: S63217.03  
 Sample Tag: PW-14-03(101614)End  
 Collected Date/Time: 10/16/2014 08:30  
 Matrix: Groundwater  
 COC Reference: 87201

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	125ml Plastic	HNO3	Yes	12.3	IR
3	40ml Glass	HCL	Yes	12.3	IR

Analysis	Results	Units	RL	Method	Run Date/Time	Analyst	CAS #	Flags
<b>Extraction / Prep.</b>								
Metal Digestion	Completed			SW3015A	10/22/14 09:30	JRH		
pH check for VOCs	<2	STD Units		N/A	10/24/14 10:10	WAT		
<b>Metals</b>								
Iron	19.1	mg/L	0.02	SW6020A	10/22/14 11:00	JRH	7439-89-6	
<b>Organics - Volatiles</b>								
1,4-Dioxane	360	ug/L	50	SW8260B - SIM	10/23/14 15:47	WAT	123-91-1	Y

Y-Elevated reporting limit due to high target concentration



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 Phone (517) 332-0167 Fax (517) 332-4034  
 www.meritlabs.com

C.O.C. PAGE # 1 OF 1

87201

**REPORT TO** **CHAIN OF CUSTODY RECORD** **INVOICE TO**

CONTACT NAME: Andrea Krevinghaus  
 COMPANY: ARCAOIS  
 ADDRESS: 28550 Cabot Drive Ste. 500  
 CITY: Novi STATE: MI ZIP CODE: 48377  
 PHONE NO.: 248.994.2240 FAX NO.: 248.994.2241 P.O. NO.:  
 E-MAIL ADDRESS: andrea.krevinghaus@arcaois-us.com QUOTE NO.:

CONTACT NAME:  SAME  
 COMPANY:  
 ADDRESS:  
 CITY: STATE: ZIP CODE:  
 PHONE NO.: E-MAIL ADDRESS:

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME: Boc 4779.0014.00501 / RACE Lansing SAMPLER(S) - PLEASE PRINT/SIGN NAME: Adam Richmond / [Signature]  
 TURNAROUND TIME REQUIRED:  1 DAY  2 DAYS  3 DAYS  STANDARD  OTHER  
 DELIVERABLES REQUIRED:  STD  LEVEL II  LEVEL III  LEVEL IV  EDD  OTHER

Certifications  
 OHIO VAP  Drinking Water  
 DoD  NPDES  
 Project Locations  
 Detroit  New York  
 Other  
 Special Instructions

MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID  
 SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIPE A=AIR W=WASTE

# Containers & Preservatives

MERIT LAB NO. <small>FOR LAB USE ONLY</small>	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	NaOH	MeOH	OTHER	1,4 Dioxane SIMS	6020 Iron Total
	DATE	TIME												
63217.01	10/14/14	1220	PW-14-03(101414) Begin	GW	4		3	1					X	X
.02	10/15/14	1330	PW-14-03(101514) Mid	GW	4		3	1					X	X
.03	10/16/14	0930	PW-14-03(101614) End	GW	4		3	1					X	X

RELINQUISHED BY: [Signature] ARCAOIS  Sampler DATE: 10/16/14 TIME: 0900  
 RECEIVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 RELINQUISHED BY: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 RECEIVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

RELINQUISHED BY: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 RECEIVED BY: [Signature] DATE: 10/16/14 TIME: 1655  
 SEAL NO. SEAL INTACT INITIALS NOTES: TEMP. ON ARRIVAL 12.3  
 YES  NO   
 SEAL NO. SEAL INTACT INITIALS  
 YES  NO