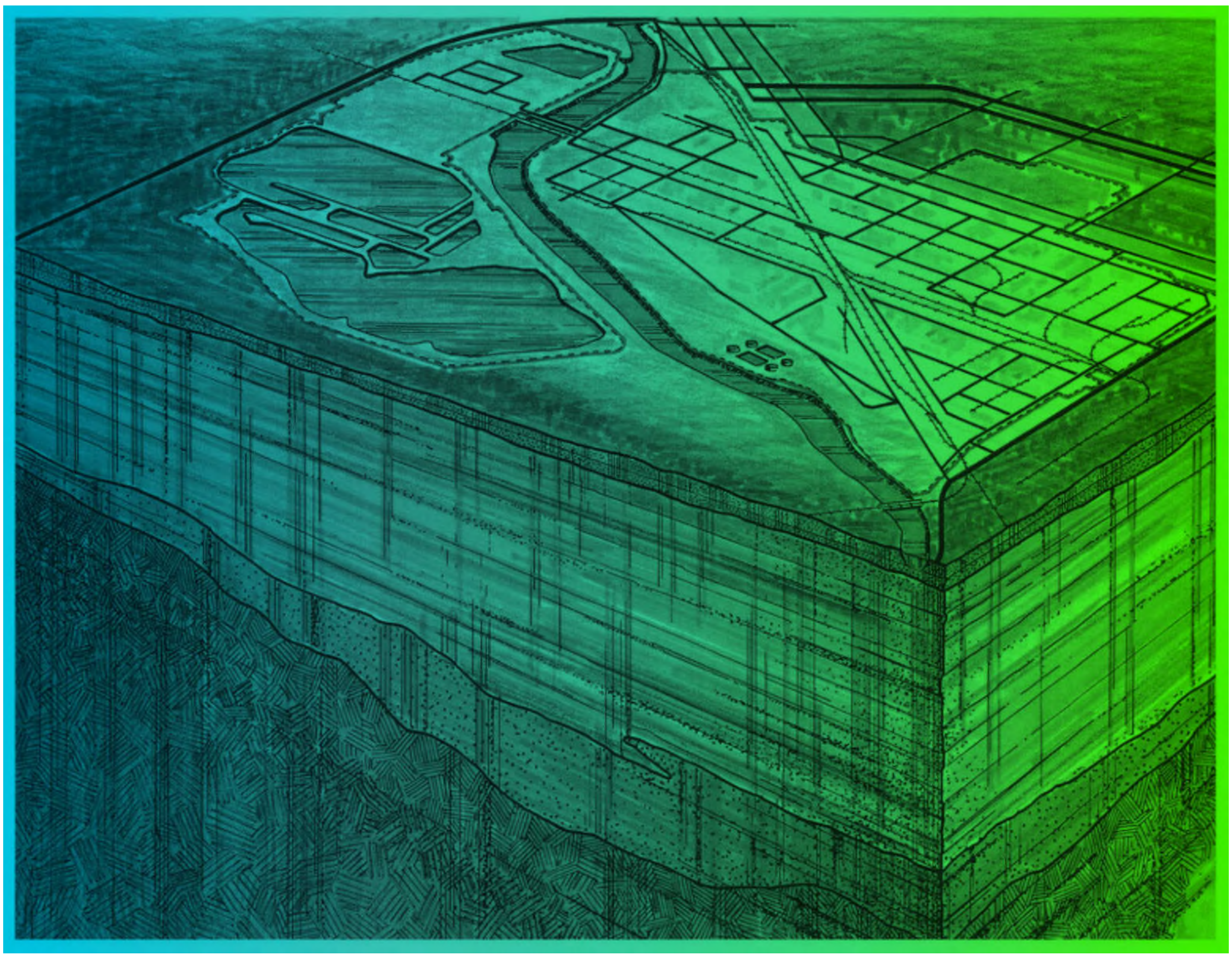
AECOM

Prepared by
AECOM
25 Building
Midland, MI 48667
September 2019

Sampling and Analysis Plan

Midland Plant and Salzburg Landfill



The Dow Chemical Company
Revision 8A

Table of Contents

Tables

Figures

Appendices

Appendix M Statistical Methodology for Performance Criteria

1 Introduction and Scope

This Sampling and Analysis Plan (SAP) was created in accordance with the Hazardous Waste Management Facility Operating License for The Dow Chemical Company (Dow) Midland Plant and Salzburg Landfill Facilities, issued under Part 111 Michigan's Natural Resources and Environmental Protection Act (Public Act 451) on September 25, 2015. This SAP describes and lists procedures for the following sampling programs at Michigan Operations:

Groundwater Detection Monitoring

- Glacial Till and Regional Aquifer Detection Groundwater Monitoring

Surface Water Protection Monitoring

- East-Side Revetment Groundwater Interception System (RGIS) Hydraulic Monitoring
- East-Side RGIS Chemical Monitoring
- West-Side and Tertiary Pond RGIS Hydraulic Monitoring
- West-Side and Tertiary Pond RGIS Chemical Monitoring
- 6 Pond Collection Tile Hydraulic Monitoring
- 6 Pond Collection Tile Chemical Monitoring
- River Corrective Action Monitoring
    - Sandbar Hydraulic Monitoring
    - Sandbar Chemical Monitoring
- 7th Street Purge Wells Area Monitoring
- Ash Pond Area Groundwater Monitoring
- Former 47 Building Area Surface Water Protection Monitoring

Site-Wide Waste Management Units Monitoring

- Northeast Perimeter Groundwater Monitoring
- West-Side Shallow Groundwater Monitoring
- Facility Shallow Groundwater Hydraulic Monitoring
- South Saginaw Road Tile Hydraulic Monitoring
- South Saginaw Road Tile Chemical Monitoring

Post Closure Monitoring

- Sludge Dewatering Facility Monitoring

Closed Waste Management Units Monitoring

- Poseyville Landfill Monitoring
- LEL Site I Monitoring
- LEL Site II Monitoring
- LEL Site III Monitoring

– 1925 Landfill Monitoring

Tertiary Pond Monitoring

– Groundwater Recovery Monitoring
– Tertiary Pond Slurry Wall Hydraulic Monitoring

Monitoring Areas of Concern

– Overlook Park Groundwater Monitoring
– US-10 Tank Farm Monitoring

Ambient Air Monitoring Program

– Midland Plant
– Salzburg Landfill

Soil Monitoring Program

– Midland Plant Sites
– Salzburg Landfill Sites

Salzburg Landfill Monitoring Programs

– Leachate Monitoring Program
– Salzburg Landfill Leak Detection Monitoring
– Salzburg Landfill Surface Water Monitoring
– Salzburg Groundwater Detection Monitoring

2 General Procedures and Guidelines

The General Procedures and Guidelines section includes guidelines that apply to all sampling conducted under this Sampling and Analysis Plan. Guidelines that apply specifically to the groundwater, surface water protection, leachate and soil monitoring programs can be found in subsequent sections.

2.1 Pre-Sampling Procedures

1. Review Table 2 to determine frequency of sampling event, sampling locations and monitoring parameters required under each program.
2. Notify team members and affected parties of planned sampling dates.
3. Prepare labels with location ID and parameter(s).
4. Label chain-of-custody form(s) with location ID and parameter(s).
5. Gather necessary bottles (reference Table 1).
6. Gather applicable sample collection equipment (examples shown below):
7. Field instruments will be calibrated, per manufacturer's instructions, prior to use each day and noted in the field records. Pressure gauges will be calibrated in accordance with manufacturer's instructions.

- Bottle carriers
- Blank water
- Deionized water
- Ice chests w/ice
- Pre –preserved bottles
- Field Parameter Probes
- Thermometer
- Bucket for purge water
- Filtering equipment
- Bailers
- Low-flow Equipment
- Generators
- Volumetric Flask
- PPE
- Adapters for SLF GW Pumps
- Procedures
- Pump tubing and clamp
- Eye shower
- Bottles
- Watch
- Chains-of-custody
- Static Water Level meter
- Stainless steel spoon
- Stainless steel scraper
- Pressure gauge and fittings
- Tweezers
- 0.25-inch stainless steel Sieve
- Scrubbing brush
- Ottawa sand standard
- Resealable plastic bags
- Laboratory grade detergent
- Well Inspection Log*
- Field data sheet*
- Stainless steel bowl or disposable aluminum
- One-inch diam. stainless steel soil sampling probe

*If field tablets are used for electronic data capture/entry, all data will be stored and archived.

2.2 Documentation/Chain-of-Custody Procedures

Appropriate documentation is essential to ensure the possession and handling of samples is traceable from the time of collection through analysis and final disposition. This documentation of the history of the sample is referred to as “chain-of-custody”. Chain-of-custody documentation includes:

- Sample labeling;
- Field records (hardcopy data sheet, example in Appendix F); and
- Chain-of-custody form (hardcopy example in Appendix D).

A person who has samples in custody must comply with these Chain-of-Custody Procedures. During collection, analysis and final disposition, a sample is considered to be under a person's custody when:

- The samples are in a person's physical possession;
- Are in view of the person after taking possession;
- Are secured by that person so that no one can tamper with it; or
- Are secured by that person in an area that is restricted to authorized personnel.

Samples must be labeled to prevent mis-identification. Sample labels will be affixed to sample containers prior to or at the time of sampling. Sample labels will contain the following information:

- Sample location ID;
- Name or initials of sampler;
- Date and time of collection;
- Preservation information;
- Place of collection; and
- Analysis to be performed on the sample.

Information pertinent to a field survey or sampling will be documented in the field records. Field records and inspections may be captured electronically in the field using a tablet or field computer, or they may be captured in hardcopy, using a field data sheets or well inspection sheets (hardcopy example included in Appendix G). Field parameters shall be taken immediately prior to collecting the sample and documented in the field records. It is essential that all samples be collected properly and that actual conditions during each sample collection are completely documented. At a minimum, entries on the field records will include the following:

- Location of sampling point;
- Sample Location ID;
- Name or initials of the sampler;
- Date/time of purging and/or sampling;
- Number and volume of sample taken;
- Analyses to be performed on samples;
- Static Water Level (SWL) reading (for groundwater samples);
- Purge volume (for groundwater samples);
- Field parameters (such as temperature, pH, specific conductivity); and
- Additional field information determined by the sampler to be important (i.e. abnormal conditions, well damage, weather conditions, nearby construction/traffic).

Additional field documentation will include sufficient information to allow reconstruction of the sampling without reliance on the sampler's memory. A permanent writing instrument should be used to record all information on hardcopy field data sheets. The proper correction technique is to draw one single line through the error and initial/date it at the point of error.

2.3 Equipment Decontamination Procedures

To minimize sample contamination problems, dedicated sampling (or well evacuation) equipment will be used whenever possible and new pre-cleaned bottles are to be used. The use of dedicated equipment is not always possible; therefore, a procedure for cleaning of and sampling with non-dedicated equipment is critical in obtaining representative samples. If non-dedicated equipment is used, an equipment blank must be obtained according to the Quality Control Table in Appendix A. When non-dedicated or new sampling equipment is used the equipment will be cleaned prior to use by the procedures described below. The wells will be sampled in order of cleanliness, if known (i.e., up gradient before downgradient). Between sampling points, the equipment will be rinsed with deionized water and rinsed with the well water before the sample is taken. Depending on the piece of non-dedicated equipment used (e.g., submersible pumps, non-disposable bailers, stainless steel soil sampling tools, surface water dipper) non-phosphate detergent may be used to thoroughly clean equipment. See section 3.1.2 regarding the decontamination of the SWL meter between wells.

2.3.1 Pre-Sampling Decontamination of Non-Dedicated Sampling Equipment

1. Water and soap wash using non-phosphate detergent;
2. Tap water rinse;
3. Deionized water rinse and air dry;

2.3.2 Pre-Sampling Decontamination of Static Water Level Meter, pH/Temperature/Conductivity/or other Field Measurement Probe(s)

1. Water and soap wash using non-phosphate detergent;
2. Tap water rinse;
3. Deionized water rinse and air dry.

2.4 Purge Water Management Procedures

Purged water from wells where previous analyses have not identified chemical concentrations above Part 201 Cleanup Criteria will be diverted away from the well and discharged onto the ground. Purged water from wells where there is no prior analyses or where prior analyses has identified chemical impacts above Part 201 Cleanup Criteria will be collected in a portable holding tank. All collected, purged water will be treated at the Dow Waste Water Treatment Plant via discharge to the on-site sewer, or an equivalent facility.

2.5 Sample Preservation

Sample preservation techniques are used to retard the chemical and biological changes that inevitably continue after the sample is removed from the parent media. Therefore, as a general rule, it is best to analyze the samples as soon as possible after collection within the prescribed hold times as outlined in Table 1. Sample preservation may be done prior to or immediately following collection of a sample. Preservatives added after sampling should be done in the field.

Methods of preservation are relatively limited and are intended generally to (1) retard biological action, (2) retard hydrolysis of chemical compounds and complexes, (3) reduce volatility of constituents, and (4) reduce absorption effects. Preservation methods are generally limited to pH control, chemical addition, refrigeration, and freezing. Caution should be used while adding preservatives or filling pre-preserved bottles, as preservatives typically exhibit very high or very low pH and may cause burns. Constituent and media specific preservation methods are presented in Table 1. Laboratories verify whether or not proper preservation was present in the sample in analytical reports.

2.6 Sampling Procedures

All samples shall be collected in appropriate bottles (see Table 1). If an open bottle is found in the manufacturer's box, this bottle will be discarded. All sample and blank bottles will have a label affixed that is readable and clear. In liquid volatile samples, no head space should be present in the 40-ml glass vials. If zero-head space is not possible, this must be documented in the field records.

New gloves shall be used at each sampling location or anytime items other than the clean sampling tools/bottles are handled. Care must be used while handling sample containers and caps so that contamination is not introduced during the collection process.

Liquid dissolved metal samples will be filtered as soon as possible with a 0.45 µm pore size glass filter. Prior to filling bottles, allow liquid to discharge through filter for approximately 5 seconds. Analysis for total metals will not be field filtered.

If a sample is unable to be collected due to icy/frozen condition or the sample location point is inaccessible for some reason, a sample should be collected as soon as the condition allows during that same quarter.

2.7 Sampling Sequence

Samples should be collected and containerized according to the volatility of the target analyses. The proper collection order is as follows:

1. Volatiles;
2. Semi-Volatiles (Extractable, EOAs);
3. Total Organic Carbons (TOC);
4. Metals and Cyanide; and
5. Any other parameters.

2.8 Post-Sampling Procedures

1. Prior to leaving the site, ensure all field data has been recorded in the field records.
2. Transport samples on ice to appropriate locations.
3. Transfer samples along with chain-of-custody form(s) to analysts.
4. Clean all sample equipment as described in Equipment Decontamination Procedures.
5. Document any damaged wells, unsafe or abnormal conditions noted during sampling on the field records and notify the environmental monitoring program coordinator.

2.9 Maintenance & Inspections

During each sampling event, all monitoring locations will be inspected for integrity, damage, and/or safety issues. Monitoring wells may be inspected for damaged well casings, protective covers, fittings, and pump heads; missing locks and labels; signs of corrosion or surface erosion; reduced well performance; malfunctioning equipment; standing water at the well; and/or leakage. This inspection will be documented in the well inspection records (see Appendix G for a hardcopy example). Other media will also be inspected and findings will be documented on the field records. Lift stations and collection sumps may be inspected for damaged or missing manhole lids, locks, and/or labels (see attached Table 6, Inspection Schedule). Surface water outfalls may be inspected for evidence of erosion or sediment transport, outfall blockage, and/or missing labels. Ambient air monitoring stations may be inspected for damaged timers, gauges, and/or power supply. Soil boxes may be inspected for damaged and/or missing box markers, labels, or barricades.

Any deficiencies will be noted in the field records and reported to the environmental monitoring program coordinator for appropriate corrective action(s).

2.10 Quality Control and Assurance

All samples collected and analyzed per this SAP will be maintained by good quality control and good laboratory practices. The Quality Control statement is located in Appendix A along with the QA/QC plan for sampling events. In addition, the Dow Environmental Laboratory Quality Assurance Program is located in Appendix C.

2.11 Data Analysis and Reporting

All data collected per this SAP will be analyzed according to the respective section of Table 2, Sample Collection Chart and Part X of the Operating License. Results of all environmental monitoring required by the License and any additional environmental sampling or analysis conducted beyond that required by this license must be reported or provided to the Office of Waste Management and Radiological Protection (Office) in accordance with Condition IX.A.4 of the Operating License.

Upon approval of an Environmental Monitoring Information System (EMIS), Dow is approved to provide the results of environmental monitoring required by the License to the Office annually by a Report as specified in Condition IX.A.4(a)(i) of the License. Quarterly reporting will be completed by updating an EMIS approved by the office pursuant to Condition IX.A.4.(c).

Data for samples that are analyzed for the 17 International Toxic Equivalency Factor (ITEF) dioxin and furan isomers, will be expressed as toxic equivalent concentrations (TEC) based on WHO-TEC factors (World Health Organization 2005 Toxic Equivalency Factors). For samples where a specific congener was not detected, one-half the detection limit (DL) of that congener will be used to calculate the WHO-TEC for that sample. If an Estimated Maximum Possible Concentration (EMPC) is indicated in place of the DL, the EMPC will be used as the DL and the data will be flagged to reflect the use of the EMPC.

A copy of field sheets will not be provided in the Environmental Reports but will be provided to the Office upon request.

2.12 Future Updates to SAP Procedure

This SAP may need to be updated periodically. For each update to this SAP, no matter how minor, the complete document is to be updated and given a revision number/revision date. Additionally, each revision will be summarized and recorded on Table 8 and highlighted within the updated SAP document for change tracking before a final version is accepted

3 Groundwater Monitoring and Surface Water Protection Monitoring Field Procedures

To comply with rules R 299.9611(2)(b) and R 299.9612, groundwater monitoring programs will be conducted in accordance with this SAP at the Midland Plant and Salzburg facilities. In addition, to comply with rules R 299.9521(3)(a) and (b) and R 299.9611(5)}, surface water protection monitoring programs will be conducted at Midland Plant Facility. The Groundwater Monitoring and Surface Water Protection Monitoring Field Procedures section includes guidelines for obtaining hydraulic reading/static water levels from groundwater wells, well purging, and sampling. General procedures and guidelines for all sampling media are discussed in the General Procedures and Guidelines section.

3.1 Hydraulic Readings / Static Water Levels (SWL)

All monitoring wells are protected by a secured perimeter fence or by locking protective casing with a Dow lock. Where necessary, collision protection is in place around wells. The wells will be inspected for physical damage and any problems that may have occurred will be documented on the well inspection sheet (see Appendix G).

Static water level (SWL) readings will be obtained prior to purging any water from the well. SWLs from all wells that are used to generate contours or gradient calculation will be obtained during a single 24-hour period, according to the locations and frequency specified in Table 2, Sample Collection Chart. The SWL will be recorded in the field records. There are two techniques used to obtain static water level (SWL) readings: one for flowing wells (pressurized) and another for piezometers and monitoring wells; both are discussed below.

3.1.1 Flowing Wells

For flowing wells, a SWL will be calculated from pressure readings taken from the valve stem on the top of the well head. A digital pressure gauge (typical gauge range is 0 to 500 inches of water) is attached to a valve stem and the water level will be read in inches of water. Pressure readings shall be obtained within a period not to exceed 24 hours prior to sampling, following the directions below:

1. Open valve on the well head to allow pressure to equalize behind the valve stem.
2. Turn on the pressure gauge by pushing the red button and checking the LED to make sure batteries are working.
3. Attach the air fitting on the pressure gauge to the valve stem on the well head.
4. Give the pressure gauge time to stabilize (approximately one minute).
5. Record the pressure reading in feet of head, recorded to the nearest hundredth of a foot.

The measured SWL (in feet) will be equal to Top of Casing (TOC) plus the measured pressure, according to the following equation: SWL (ft.) = TOC (ft.) + Pressure (ft.).

For pressured wells that use multi-level system a procedure has been developed to collect data and use formation pressure readings to convert to feet of head above the reference elevation.

3.1.2 Piezometers and Monitoring Wells

Foreign substances other than the indicator probe will not be introduced into the well casing. A clean electric water level indicator will be used to determine the SWL. An indicator tape graduated in hundredths of feet will be used.

Prior to use, clean the SWL indicator with deionized water and a clean paper towel, followed by another water rinse. This prevents cross contamination between wells.

Next, test the SWL indicator by turning it on and depressing the test button. There is an audible tone indicating the SWL indicator is working. Measure the SWL using the following steps:

1. Lower the SWL indicator probe into the well casing slowly until the tone is audible. At this point, the SWL has been reached.
2. Static water level readings should be taken consistently from the same location at the top of the well casing, which is done by permanently marking the casing via placement of a mark or notch.
3. The SWL indicator probe should be lifted at least a few inches above the water level and then lowered for another SWL reading. Continue this until a consistent SWL reading has been confirmed.
4. Record the SWL to the nearest hundredth of a foot in the field records.
5. Slowly remove the indicator probe from the well, and remove any liquids using paper towels. Dispose of waste towels appropriately.
6. The stainless steel SWL indicator probe shall be rinsed with deionized water and wiped dry after every SWL reading.
7. Store the SWL indicator in a clean dry place when not in use.

3.2 Well Reference Elevations

Well casings will be referenced to a USGS reference datum elevation. See Table 4 for monitoring well specifications. Wells will be surveyed after new installations, upgrades, repairs, or according to the schedule provided in Appendix E.

3.3 Well Purging

Purging and sampling should be completed as specified in Table 3. After collecting a SWL reading and before sampling a well, the stagnant water in the well casing needs to be removed to insure that a representative sample can be taken. This can be achieved using one of two methods of purging, fixed-volume purging or low flow purging. Refer to Table 3 for the method required for each monitoring program.

3.3.1 Fixed-volume Purging

If fixed-volume purging is required, the following steps should be used to remove three well casing volumes of water by either bailing, pumping, or by opening the valve on a flowing well. It is first necessary to determine the quantity of water contained within the well casing. This is done by subtracting the depth to standing water from the depth of the well. The depth of each well is listed on the field records. The difference between the well depth and the water level depth is the height of water standing within the well. Multiply this height of water by the volume conversion factor, based on the diameter of the well, for a total volume of water in the well casing. The well diameters are listed in Table 4, Monitoring Well Specifications, and the corresponding volume conversion factors are listed on the field records. Multiply this sum by 3 (the number of well volumes to be removed) which is the minimum recommended.

3.3.1.1 Equation for Purge Volumes

for 2" diameter wells
For non-flowing wells:
Well Depth – SWL = Feet of Water
Feet of Water x 0.163 = Total Water in a 2" diameter well casing (in gallons)
Total Amount of Water x 3 = Purge Volume prior to sampling (in gallons)
For flowing wells (pressure reading):
Well Depth x 0.163 x 3 = Purge Volume prior to sampling

for 4" diameter wells
For non-flowing wells:
Well Depth – SWL = Feet of Water
Feet of Water x 0.636 = Total Water in a 4" diameter well casing (in gallons)
Total Amount of Water x 3 = Purge Volume prior to sampling (in gallons)
For flowing wells (pressure reading):
Well Depth x 0.636 x 3 = Purge Volume prior to sampling

Specific procedures used to purge a well are listed below, in Sections 3.3.2-3.3.4.

3.3.1.2 Flowing Wells

Flowing wells are positive pressure wells. The well volume is calculated using the equation in section 3.3.1.1. Flowing wells will be purged by opening the discharge valve. When purging flowing wells, the water flow shall be diverted away from the well so it does not gather around or seep back into the well. The well will be sampled when purging of at least 3 well volumes is complete.

3.3.1.3 Submersible Pump Wells

Each well has an electrical fitting on the well head that is to be connected to the appropriate pump controller (110 VAC or 12 VDC). Purge the well using the following steps:

110 Volt AC Pump

1. Start the generator at a down-wind location and allow it to warm up.
2. Plug the controller into the generator, making sure the controller is turned off and at the lowest setting.
3. Attach the controller lead to the well head connector.
4. Turn on the controller with the red switch marked start.
5. Adjust the flow rate with the variable control dial to the desired flow rate. Maintain a low flow rate to minimize re-suspension of fine particles and disturbance of the filter pack.
6. Sampling may commence after purging is complete. If a well is effectively pumped dry, the well will be sampled within a 24 hour period and once adequate recharge of water exists in the well in a volume sufficient to collect samples.

12 Volt DC Pump

1. Connect cables to truck battery or battery pack.
2. Plug the other end of the cable into pump controller.
3. Turn controller on, if necessary (some controllers automatically turn on hooked up to the battery).
4. Adjust controller until desired flow rate is reached. Maintain a low flow rate to minimize re-suspension of fine particles and disturbance of the filter pack.
5. Sampling may commence after purging is complete. If a well is pumped dry, the well will be sampled within a 24-hour period.

3.3.2 Zero- Purge Multi-Level Sampling

For GTRA wells that require sampling at multiple levels, or depths, a zero-purge multi-level sampling technique is used. This system is used at C7, C8, and C9 wells. The system collects discrete fluid samples at formation pressure. For sample collection the probe and sample container are lowered to the desired depth, where the sample is collected into the container. The probe and container are then retrieved to the surface for further analysis. The following steps outline the zero-purge, multi-level sampling process.

1. Apply vacuum to sample container at surface
2. Set sample port to reference point at the surface and reset depth indicator to zero
3. Lower sample container and probe to the desired depth as indicated by the depth indicator
4. The probe will also produce and audible alarm when you are within two feet of the sample point/depth
5. The probe will seat itself into the sampling port
6. Once in the sampling port, sampler will activate the system to open the vacuumed container and pull a sample from the desired depth.
7. Log the formation pressure at each location.

After a sample is taken, the valve closes, and the sampler and container are brought up to the surface. The sample container has valves at both ends so that a sample can either be decanted into final sample containers. Containers are decontaminated between sample locations and depth. Sampler probe also contains a pressure sensor that measures the pressure inside the well before sampling, the formation pressure before sampling, the pressure during sampling, and the fluid pressure inside the casing after sampling. These measurements confirm that the sampler is operating properly and that the sample was taken from the monitoring zone outside the measurement port coupling.

3.3.2.1 Groundwater Collection Lift Stations and Purge Wells

Lift station and purge well control panels are equipped with "auto/off/manual" capability. Each lift station or purge well will be toggled to "manual" to control flow from the sampling port. The sample port will be opened to clear lines of any stagnant water prior to sample collection. Volume of stagnant water and the required flow time to remove the water will be estimated by calculating the volume of water in the horizontal piping based on the length (to the sample port) and diameter of the piping present at each lift station. The amount of time required to purge the water will be based on estimated flow rates at each lift station. With only one pump operating, the typical flow rate leaving the sample port of a lift station is approximately 200 gallons per minute. An example calculation using a typical meter run to sample port lengths, pipe diameters and flow rates is provided below:

Volume = $\pi\ x\ radius^2 x\ length = \pi\ x\ \left(\frac{4\ inch\ dia.}{2}\right)\ x\ 10\ ft\ \left(\frac{12in}{ft}\right) = 1507\ in^3 = 6.53\ gallons$

$$\frac{6.53\ gal}{200\ gpm} = .033\ minutes = \mathbf{1.96\ seconds\ of\ purging}$$

Water in drain lines will be purged to a container for proper disposal. After sample is collected the sample port is closed and lift station or purge well is returned to automatic pumping capability. As the pumps in these purge wells and lift stations are constantly cycling high volumes of water (thousands of gallons per day) 24 hours a day, seven days a week with minimal non-pumping periods, the need to purge 3 well/lift station volumes to obtain a representative sample of the specific media does not apply.

3.3.2.2 Pumping Rates & Stabilization

Well purging is conducted to obtain groundwater samples that are representative of groundwater conditions in the geologic formation. The rate at which wells are purged should be kept to a minimum to prevent dewatering the well filter pack to the greatest extent possible. The purge rate for clay wells should not exceed 1 gal/min (gallons per minute) unless drawdown during purging cannot be stabilized (i.e the well goes dry before three well volumes have been purged from the well). The purge rate for Regional Aquifer wells should not exceed 3 gal/min. Excessive purge rates and/or filter pack dewatering can result in increased turbidity of water samples and could diminish the sample quality. Purging can be considered complete after 3 well volumes have been purged or if the well has been pumped dry. Sampling will commence after purging or within 24 hours if the well is pumped dry.

3.3.3 Low Flow Groundwater Purging

Low flow groundwater purging consists of purging a well at a rate slow enough to minimize turbidity, eliminate gas exchange between the sample and the atmosphere, and obtain groundwater from the surrounding soils instead of stagnant water in the well casing. Purging should be conducted with the pump intake at the middle or toward the top of the screened interval. While purging, record measurements of the following secondary parameter values using a multi-meter or flow-through cell:

- Static water level;
- Flow rate;
- Dissolved oxygen;
- Temperature;
- Specific conductivity;

- pH;
- Oxidation/Reduction potential (ORP); and
- Turbidity.

This can assist in determining when formation water is being removed from a well. At the point when the secondary parameters are observed to stabilize, formation water is being obtained and sampling can proceed. Site specific stabilization criteria are typically determined when the previous three or more readings for each parameter (taken at regular time intervals) are within defined acceptable ranges. Default criteria applied to the last three readings are as follows:

Parameter	Default Stabilization Criterion
Drawdown	Maintain less than 0.3 meters of drawdown (if possible).
Dissolved Oxygen	+/- 10% or < 0.30 mg/L
Specific Conductivity	+/- 3%
pH	+/- 0.1 SU
ORP	+/- 10 mV
Minimum Flow Rate	Shall be determined based on lowest possible flow rate that can achieve complete flow cell exchange between readings.
Turbidity	< 20 NTU or +/- 10%

Sampling may commence after stabilization, provided the purging rate does not increase. Turbidity is the least suggestive indicator of stabilization as it is often the last to stabilize and may be naturally occurring. Turbidity in groundwater samples may be naturally occurring, caused by sampling disturbances or filter pack siltation. Knowledge of site geology, well design, and sampling methodology is helpful in determining the source of turbidity and the method of sampling. Turbidity due to sampling disturbances should be eliminated or minimized while naturally occurring turbidity or turbidity due to contamination should not. Deviations from the default stabilization criteria should be noted on the field records. In some cases, the default stabilization criteria will need to be supplemented with well or site-specific criteria. If parameter stabilization criteria are too stringent, then minor fluctuations in indicator parameters may cause sampling to become unnecessarily delayed. If well or site-specific criteria are developed, they will be followed each time a well is sampled.

Static water levels in the well should be monitored periodically during purging to evaluate the level of drawdown in the well. Ideally, drawdown should be kept to <0.1m during purging. This goal may be difficult to achieve under some circumstances due to heterogeneities within the screened interval, and may require adjustment based on well or site-specific conditions and past sampling experience. If well or site-specific criteria are developed, they will be followed each time a well is sampled. If drawdown cannot be stabilized an alternate purging method will be employed; purging to dryness and returning within 24 hours to collect the sample is the preferred method in most cases.

3.4 Sampling Procedures

Sampling should be performed in accordance with Section 2.0, General Procedures and Guidelines. Field data and samples shall be obtained according to the location, frequency, parameters, and analytical requirements as specified in Table 1, Environmental Analytical Sample Collection Specifications, and Table 2, Sample Collection Chart. The complete Dow Analytical Chemical Constituent, Analytical Method, and Reporting Limit List are referenced in Appendix B.

Sampling may commence after purging procedures are complete. If wells are effectively purged dry, wells will be sampled within 24 hours and any dissolved metals sample will be filtered during sample collection. Filtration will be completed using a peristaltic pump and a .45 micron filter. If the sample is bailed, an aliquot of the sample will be poured into a container and then purged through the filter using a peristaltic pump into the properly preserved container. Sampling will be done at the lowest continuous flow rate possible. If sampling does not immediately follow purging, the pump lines should be filled with fresh well water pumped at the lowest flow rate possible before sampling. Inspect each well and pump for damage or tampering and document any changes in the well inspection records.

For lift stations or purge wells, sampling can begin after lines have been purged of stagnant water. Reference Section 3.3.2.1 for calculating the volume of water to be removed prior to sampling. After sampling, close sample port and return lift station to “auto” control, as necessary. Inspect each lift station or purge well for damage or tampering and document any changes in the field records.

3.5 Equipment, Trip and Field Blanks

Trip blanks will be prepared according to the Quality Control Table in Appendix A, and remain unopened throughout the sampling day. Trip blanks are used to evaluate the potential for contamination during equipment and sample transport. Laboratory testing of trip blanks is optional, and may be conducted if field blank samples detect constituents of concern. Bottles shall be prepared according to Appendix A, and the time they were prepared will be recorded in the field records. Preservatives (if necessary) will be added to the trip blanks at the time the bottles are filled, to prevent opening the bottles in the field. At the end of the sample event, trip blanks will remain with the collected samples until they are analyzed...Trip blanks for liquid samples should be free of constituents in question. Untested Trip Blanks will be discarded.

Field blanks will be prepared and analyzed according to the Quality Control Table in Appendix A and treated in the exact same manner as the rest of the samples. Field blanks are used to evaluate the potential for contamination during sampling. The field blank media will be transported to the field in clean new containers with the proper labeling. The field blank bottles may be filled at any time in the field during the sampling process. Field blanks for liquid samples should be free of constituents in question.

In the event that new or non-dedicated sampling equipment is used, an equipment blank will be submitted for each parameter and treated in the same manner as the rest of the samples (see Quality Control Table in Appendix A). An equipment blank will be collected by pouring deionized or distilled water over or through the sampling equipment and collecting the rinsate in the sample bottles. At the end of the sample event, equipment blanks will remain with the samples collected.

3.6 Duplicate Samples

Field duplicate samples will be obtained for environmental monitoring projects according to the Quality Control Table in Appendix A.

3.7 Well Installation Cross-Contamination Prevention Procedures

Additional or replacement wells should be installed in a manner which prevents cross-contamination, in accordance with Condition IX.A.2.(b), and Appendix K, or an approved plan. Soil boring equipment, tooling, and well materials should be thoroughly steam-cleaned with clean water prior to use at the site. When drilling monitoring wells, a surface casing should be set to isolate the borehole from the shallow surface sediments. Lubricants should not be used on equipment that enters the well bore.

New PVC, rubber, or nitrile gloves should be worn by workers contacting the well string during installation. Teflon tape may be used to seal threaded joints on the well string or surface casing. Clean, bagged filter sand, unopened buckets of bentonite pellets, and bagged bentonite for grout will be used during well installation.

4 Leachate Monitoring Field Procedures

The Leachate Monitoring Field Procedures section includes guidelines for sampling and inspecting leachate collection lift stations at Salzburg Landfill (SLF), Sludge Dewater Facility (SDF), and Sand Bar Lift Station. General procedures and guidelines for all sampling media are discussed in the General Procedures and Guidelines section.

4.1 Sampling Procedures

Samples shall be obtained according to the location, frequency, parameters, and analytical requirements as specified in Table 1, Environmental Analytical Sample Collection Specifications, and Table 2, Sample Collection Chart. Leachate sampling will be dependent upon sufficient leachate flow. Each lift station must be visually inspected to determine if there is sufficient leachate for sampling to occur.

SLF, SDF, and Sand Bar lift station are sampled with bailers.To obtain a sample, the lift station cover is removed. The bailer will be slowly lowered into the lift station and allowed to fill with leachate. After filling, the bailer is retrieved through the opening. Sample bottles are filled directly from the bailer. The retrieval string shall be disposable nylon string that is discarded after each use.

Complete field data records for each lift station, as described in Section 2.2. Inspect each lift station for damage or tampering and document any changes in the field records.

4.2 Equipment, Trip and Field Blanks

Trip blanks and field blanks are not required for leachate sampling events (see the Quality Control Table in Appendix A).

4.3 Duplicate Samples

Field duplicate samples will be obtained for environmental monitoring projects according to the Quality Control Table in Appendix A.

4.4 Flow Volume Checks

Leachate flow volumes will be recorded using flow meters. Data will be obtained and reported according to the location and frequency requirements as specified in the relevant portions of Table 2, Sampling Collection Chart.

5 Soil Monitoring Field Procedures

The Soil Monitoring Field Procedures section includes guidelines for sampling surface soil and soil boxes at Midland Plant and Salzburg facilities. General procedures and guidelines for all sampling media are discussed in the General Procedures and Guidelines section.

5.1 Sampling Procedures

Soil samples will be obtained according to the location, frequency, parameters and analytical requirements as specified in Table 1, Environmental Analytical Sample Collection Specifications, and Table 2, Sample Collection Chart.

5.1.1 Surface Soil and Soil Box Composite Sampling

Non-volatile constituents will be collected using this composite sampling technique, which includes, clearing the site, obtaining the sample cores, homogenizing the sample cores, and containerizing the samples.

At each sample site, the vegetation will be trimmed to the surface and new sample gloves will be donned. Fifteen soil cores will be obtained from locations around an approximately three foot radius circle at fifteen inch intervals, using a one inch diameter soil survey probe. A ‘hoop’ template will be used to indicate the locations at which the individual cores are collected. If it is determined that more than 15 cores are needed, they will be obtained by continuing to collect samples around the circle. Large roots or debris (stones, pebbles, roots, twigs, or other non-soil) will be removed with tweezers. Each soil core will be placed on a 0.25-inch sieve inside a stainless steel bowl.

The composite sample will be made by collection the top one-inch (1”) of soil from fifteen (15) soil core location within the hoop, the samples will be processes as described above and homogenized prior to transfer to pre-cleaned containers. The containers will be appropriately labeled to uniquely identify each sample. An additional sample container will be filled at each location and maintained as a “contingency”. Samples will be put on ice during sampling and transport activities.

Soil samples will not be collected if the ground is frozen or during rain events.

5.1.2 Volatile Organic Compound Soil Sampling

Soil samples for volatile organic compounds will be preserved at time of sampling in the field unless method specific requirements recommend sealed sample vials with no chemical preservation (Encore® samplers) Situations where an Encore sampler would be preferred over a typical soil sampling methods include samples where low concentrations of volatiles are expected or analysis for compounds that are vulnerable to field sampling, handling, transport and preparation. Examples include TCLP and SPLP methods.

If field preservation method is utilized, the preservation of volatiles is required after the sample has been collected. This can be completed in the field by weighing the soil sample to the nearest 0.1 grams and preserving with an equivalent volume of purge-and-trap grade methanol to the sample (example: 10 grams of soil are collected, 10 milliliters of methanol are used to preserve the sample). The preservatives will be added immediately after samples are collected. Required safety equipment are nitrile gloves and safety goggles.

Preservation when using coring devices such as Encore® samplers (hermetically sealed sample vial), or equivalent, are employed include the sealed sample vial and cooling to less than 40°F. Sample must be prepared for analysis by the laboratory within 48 hours of sample collection. If soil coring samplers are used to collect soil samples for VOA analysis, one duplicate methanol preservation sampling will be performed for every ten samples or every event (if less than ten samples are obtained).

5.2 Trip and Field Blanks

Trip blanks will be prepared according to the Quality Control Table in Appendix A, by placing clean Ottawa sand in a clean sample bottle, prior to every sampling event. The trip blank will remain unopened throughout the sampling day. Trip blanks are used to evaluate the potential for contamination during equipment and sample transport. Laboratory testing of trip blanks is optional, and may be conducted if unusual or unexpected results are obtained during laboratory testing of soil samples. Sample bottles shall be prepared for all the parameters being sampled and the time they were prepared will be recorded in the field records. Preservatives (if necessary) will be added to the trip blanks at the time the bottles are filled, to prevent opening the bottles in the field. At the end of the sample event, trip blanks will remain with the samples collected and will be analyzed only if necessary. Untested trip blanks will be discarded.

Blank samples will be collected and analyzed for each sampling event to serve as both the field blank and equipment blank, according to the Quality Control Table of Appendix A. Field blanks will be submitted for each parameter and treated in the exact same manner as the rest of the samples. Field blanks are used to evaluate the potential for contamination during sampling. The field blank media will be transported to the field in clean or new containers with the proper labeling. The field blank bottles may be filled at any time in the field during the sampling process. Place a clean set of all the tools that would normally be used (spatula, core tool, tweezers, etc.) into a clean compositing bowl. Pour Ottawa sand through a clean 0.25-inch sieve into a stainless steel compositing bowl, making sure the sand touches the tools in the bowl. Use a clean spoon to place sand into the clean bottle(s).

5.3 Duplicate Samples

Field duplicate samples will be obtained for environmental monitoring projects according to the Quality Control Table in Appendix A.

6 Ambient Air Monitoring Program

The Ambient air monitoring procedures section includes guidelines for sampling ambient air at Midland Plant and Salzburg Landfill ambient air monitoring locations. General procedures and guidelines for all sampling media are discussed in the General Procedures and Guidelines section.

6.1 Sampling Procedures

Ambient air samples will be obtained according to the location, frequency, parameters and analytical requirements as specified in Table 1, Environmental Analytical Sample Collection Specifications, and Table 2, Sample Collection Chart. These requirements are in accordance with the National Ambient Air Quality Standards (NAAQS) standards and calendars. Samplers will be calibrated and maintained according to the operating instructions provided by the manufacturer. Field records will cover all field observations, required equipment and sampling information; including, but are not limited to, the following:

Apparatus name, serial number, and location;

Date of maintenance, persons doing the maintenance, and what maintenance was done;

All sampler calibration data, including the date, the time, the name of the person doing the calibration, and the results.

6.2 Field Blanks

For the TSP filters, field blanks shall be collected and analyzed for each site. The number of required field blanks shall be at least 10% of the scheduled field samples. A field blank is placed in the sampler for a short period of time, no air is pulled through the filter, and the filter is removed and sent to the laboratory for a final weight.

6.3 Duplicate Samples

Side-by-side field duplicates (co-located sampling) will be done at Site 1E/1W for organic compounds and TSP, as described in the Ambient Air Quality Assurance Section of Appendix L. A mobile sampling vehicle may be used for duplicate sampling at other sites.

7 Salzburg Leak Detection System Monitoring

The hazardous waste cells at Salzburg Landfill are equipped with secondary liners that are used as the Leak Detection System (LDS). The Leak Detection System Monitoring Field Procedures section includes guidelines for collecting samples from the secondary liner lift stations. General procedures and guidelines for all sampling media are discussed in the General Procedures and Guidelines section.

7.1 Sampling Procedures

Samples will be obtained according to the location, frequency, parameters and analytical requirements as specified in Table 1, Environmental Analytical Sample Collection Specifications, and Table 2, Sample Collection Chart.

Prior to sampling the lift stations, notify the landfill technical advisor that sampling is going to be conducted on that day. This notification is required to prevent triggering the automated alarms for the lift stations.

Secondary liner lift stations are sampled with disposable Teflon or polyethylene bailers, or by pump and controller (at the West LDS Drainage Header Cleanout only) for Cells 20-22. To obtain a sample using a bailer, the lift station cover is removed. The bailer will be slowly lowered into the lift station and allowed to fill with liquid. After filling, the bailer is retrieved through the opening. Sample bottles are filled directly from the bailer. The bailer and retrieval string shall be discarded after each use. To obtain a sample from a lift station with a sample port, sampling can begin after the lines have been purged of stagnant water. Sample bottles are filled directly from the sample port. After sampling, close the sample port and return the lift station to “auto” control, as necessary.

Samples from the LDS for cells 20-22 will be obtained from the header cleanout on the west side of Cell 20 using a dedicated submersible pump. No liquid should be stagnant in the discharge line, as the pump is not equipped with a check-valve. Prior to obtaining samples, sufficient volume will be purged to account for one volume of discharge tubing. Reference Section 3.3.2.1 of this SAP for piping/tubing volume calculations for removal of potentially stagnant water prior to sampling. Purge water will be containerized and discharged to a plant sewer manhole or catch basin at Salzburg Landfill.

Complete the field records for each lift station, as described in Section 2.2. Inspect each lift station for damage or tampering and document any changes in the field records.

7.2 Equipment, Trip and Field Blanks

Trip blanks will be prepared according to the Quality Control Table in Attachment A and remain unopened throughout the sampling day. Trip blanks are used to evaluate the potential for contamination during equipment and sample transport. Laboratory testing of trip blanks is optional, and may be conducted if field blank samples detect constituents of concern. Untested trip blanks will be discarded. Bottles shall be prepared for the parameters being sampled, according to the blank schedule in Attachment A, and the time they were prepared will be recorded in the field records. Preservatives (if necessary) will be added at the time the bottles are filled, to prevent opening the bottles in the field. At the end of the sample event, trip blanks will remain with the samples collected and will be analyzed as appropriate. Trip blanks for liquid samples should be water free of constituents in question.

Field blanks will be prepared and analyzed according to the Quality Control Table in Attachment A and treated in the exact same manner as the rest of the samples. Field blanks are used to evaluate the potential for contamination during sampling. The field blank media will be transported to the field in clean or new containers with the proper labeling. The field blank bottles may be filled at any time in the field during the sampling process. Field blanks for liquid samples should be water that is free of constituents in question.

In the event that non-dedicated sampling equipment is used, equipment blanks must be collected during the sampling event according to the Quality Control Table in Attachment A. New, clean, disposable equipment does not require equipment blanks but may be collected if preferred. If equipment blanks are required or preferred, they will be collected by pouring de-ionized or distilled water over or through the sampling equipment and collecting the rinsate into sample bottles.

7.3 Duplicate Samples

Field duplicate samples will be obtained for environmental monitoring projects according to the Quality Control Table in Attachment A.

7.4 Establishing System Baseline

Before waste is placed in any new cell or unit, a baseline concentration for constituents will be established. The system baseline will be determined by collecting at least 8 representative samples from the system that will be analyzed for the constituents in 40 CFR 264 Appendix IX.

During the first year following issuance of the licensee, flow rates will be monitored on a monthly basis and at least eight background samples of liquid from the leak detection system sumps will be collected for any parameters for which backgrounds is unavailable. Within 60 days after the last background sample is collected, the licensee shall submit a report to the Division Chief for review and approval that includes: a complete tabular summary of the statistical results, a tabular summary of flow rates, a proposed program for monthly monitoring, and an update to the SAP that incorporates the proposed program.

Annually, results of the monitoring data shall be reviewed to determine if the background data should be updated for a program or sample location. If it is determined that background data should be updated for either individual sample locations or an entire program, the MDEQ should be notified of the intent to update the background data and revise the Performance Criteria. Once the background data is re-evaluated, the updated statistics will be sent to the MDEQ for review and approval. Any update to the background data and/or Performance Criteria will not require a license modification. Plant to update the background/statistics should be discussed in the annual report.

7.5 Flow Rate Screening Criteria

The purpose of a flow rate screening criterion is to assist in the early detection of a failure in the landfill cell primary liner, through evaluations of the underlying leak detection system (LDS). A flow rate screening criterion is used under the assumption that a breach in the primary liner should result in higher flow within the LDS. The flow rate screening criterion is an attempt to recognize unusual increases in flow from normal or baseline conditions.

The flow rate screening criterion (FRSC) for each LDS will be established as the 95% upper tolerance limit (UTL) for flows greater than zero during the previous 24 months on a rolling average basis. Measured flow for each cell will be tabulated monthly and compared to the FRSC. Response actions are included in Table 2-Y.

8 Salzburg Surface Water Detection Monitoring Field Procedures

Storm water at the landfill is discharged off site through the engineered conveyances shown in Figure 22. The Surface Water Monitoring Field Procedures section includes guidelines for collecting samples from those outfalls. General procedures and guidelines for all sampling media are discussed in the General Procedures and Guidelines section.

8.1 Sampling Procedures

Samples will be obtained according to the location, frequency, parameters and analytical requirements as specified in Table 1, Environmental Analytical Sample Collection Specifications, and Table 2, Sample Collection Chart.

Complete the field records, as described in Section 2.2.

During each quarter, if there is a rain event greater than or equal to 0.5 inches and flow is observed through the outfall, surface water grab samples will be obtained. Samplers will receive an automated e-mail notification that a rain event of 0.5 inches has occurred. Grab samples will be obtained from the flow actively discharging from the outfalls within 24 hours of accumulation of 0.5 inches of rain, if enough flow exists. Samples will be obtained by either using a sampling cup or by filling new sample bottles directly at the outfall. Once a sample has been obtained during a quarter, no further sampling will be required during that quarter.

8.2 Field Blanks

Field blanks will be prepared and analyzed according to the Quality Control Table in Attachment A and treated in the exact same manner as the rest of the samples. Field blanks are used to evaluate the potential for contamination during sampling. The field blank media will be transported to the field in clean or new containers with the proper labeling. The field blank bottles may be filled at any time in the field during the sampling process. At the end of the sample event, field blanks will remain with the samples collected and will be analyzed as appropriate. Field blanks for liquid samples should be water that is free of constituents in question.

In the event that non-dedicated sampling equipment is used, equipment blanks must be collected during the sampling event according to the Quality Control Table in Attachment A. Equipment blanks will be collected by pouring de-ionized or distilled water over or through the sampling equipment and collecting the rinsate into sample bottles.

8.3 Duplicate Samples

Duplicate samples for analyses will be collected at each outfall location. The duplicate samples will be held and analyzed if a detection is found in the original sample above the performance criterion. The duplicate sample will be analyzed for confirmation purposes only. All QA/QC samples will be obtained for environmental monitoring projects according to the Quality Control Table in Attachment A.

The Dow Chemical Company
Environmental Remediation and Redevelopment
25 Building
Midland, Michigan
P 989-636-0151

Table 1. Environmental Analytical Sample Collection Specification

Liquid Samples

Parameter	Description	Bottle Size	Bottle Type [1]	Preservation	Holding Time	Number of bottles per sample point
VOA	Volatile Organic Analysis	40 mL	Glass Vial	.25 mL Sulfuric or .5 mL HCL	14 days	*4
EOA	Extractable Organic Analysis	1 L	Amber Glass	None	7/40 days (extract/analyze)	2
PCBs	PCBs Analysis	1 L	Amber Glass	None	7/40 days (extract/analyze)	2
Pesticides	Pesticides Analysis	1 L	Amber Glass	None	7/40 days (extract/analyze)	2
TOC	Total Organic Carbon	250 mL 100 mL 40 mL	Amber Glass Poly Glass Vial	2 mL Sulfuric	28 days	1
Carbs	Bicarbonate/Carbonate Analysis	120 mL	Poly	None	14 days	1
Sulfide	Sulfide Analysis	250 or 500 mL	Amber Glass	ZnAC & NaOH	7 days	1
Cyan	Cyanide Analysis	250 mL	Poly	2 mL NaOH	14 days	1
Ammonia	Ammonia	500 mL	Poly	2 mL Sulfuric (pH<2)	28 days	1
Phosphorus	Determination of Phosphorus by Semi-Automated Colorimetry	500 mL 250 mL	Poly Poly	H2SO4	28 days	1
N/NO3	Nitrite/Nitrate Analysis	500 mL	Brown Plastic	2 mL Sulfuric	28 days	1
Phenols	Phenols Analysis	500 mL	Amber Glass	2 mL Sulfuric	7 days	1
Phosphate	Total / Hydrolyzable Phosphate Orhophosphate	500 mL 500 mL	Poly Poly	2mL Sulfuric None	28 days 48 Hours	1 1
FL	Fluoride Analysis	500 mL	Poly	None	28 days	1
Sulfate	Sulfate Analysis	120 mL	Poly	None	28 days	1
Chlorides	Chloride Analysis	120 mL	Poly	None	28 days	1
Metals	Inorganic Analysis	250 mL 1L	Poly Poly	2 mL Nitric	6 months	1
TOX	Total Organic Hologens	500 mL	Amber Glass	Sulfuric Acid to a pH of <2	7 days	*4
Turbidity	Turbidity Measurements	120 mL	Amber Glass	None	48 hours	1
D / F	**Dioxin / Furans Analysis	1 Liter	Amber Glass	None	1 Year	2
Ethane	Ethane Analysis	40 mL	Glass Vial	.25 mL Sulfuric or .5 mL HCL	14 days	*4
Ethene	Ethene Analysis	40 mL	Glass Vial	.25 mL Sulfuric or .5 mL HCL	14 days	*4
Ferrous iron	Ferrous Iron Analysis	500 mL	Brown Plastic	2 mL Sulfuric	6 months	1
Carbon Dioxide	Carbon Dioxide Analysis	40 mL	Glass Vial	None	7 days	2
TSS	Total Suspended Solids	500 mL	Poly	None	7 days	1

Notes:
(1) Equivalent Bottles may be submitted.
*=With Zero Headspace
**=Consult with analysts before sampling

Table 1. Environmental Analytical Sample Collection Specification

Solid Samples

Parameter	Description	Bottle Size	Bottle Type	Preservation	Holding Time	Number of bottles per sample point
D / F	***Dioxin / Furans Analysis for Ash or Soil	250 mL	Amber Glass (Wide-mouth)	None	1 Year	2
Metals	Inorganic Analysis	250 mL	Clear Glass (Wide-mouth)	None	6 Months	2
EOA	Extractable Organic Analysis	250 mL	Clear Glass (Wide-mouth)	None	14/40 days (extract/analyze)	2
VOA	Volatile Organic Analysis	60 mL 40 mL	Clear Glass	Methanol (Method 5035)	14 days	4
TCLP / VOA	TCLP for Volatiles	250 mL	Clear Glass (Wide-mouth)	None	14 days	2
TCLP / Metals	TCLP for Inorganics	250 mL	Clear Glass (Wide-mouth)	None	180 days	2
TCLP / EOA	TCLP for Extractables	250 mL	Clear Glass (Wide-mouth)	None	14 days	2

Notes:
***=Jars half full and threads wiped clean.

Table 1. Environmental Analytical Sample Collection Specification

Ambient Air Samples

Parameter	Analytical Method	Container	Sample Volume	Sampling Duration	Target Validation Range
Organic Compounds****	EPA Method TO-15	SUMMA Canister (Passivated)	6 L	24-Hour	0.02 - 100 ug/m^3 (0.01 - 30 ppb v/v)
Total Suspended Particulates (TSP)	EPA Method IO-2.1	HI-VOL TSP (Glass Filter)	1600 m^3	24-Hour	0.001 - 70 ug/m^3

Notes:
****=Specific Organic Compounds are listed in Table 2-W.

Field Measurements

The following measurements may be taken during any field sampling, following current and applicable SW-846 or ASTM Methods:

- Temperature
- pH
- Specific Conductance
- Turbidity
- Redox Potential
- Dissolved Oxygen

Table 2-A. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Glacial Till and Regional Aquifer Detection Monitoring								
	3794	Well	Quarterly	Yes	Temp, pH, Conductivity, ORP, DO, Turbidity	VOA, EOA, METALS (filtered), SULFATE, CHLORIDE, CARBS	Primary Constituents: benzene, chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2,4-trichlorobenzene, 1,1-dichloroethane, 1,2-dichloroethane, methylene chloride, o-chlorophenol, 2,4-D, 2,4-dichlorophenol, pentachlorophenol, phenol, silvex, 2,4,5-T, 2,4,5-trichlorophenol, bromoform, 1,2-dibromoethane, dibromomethane, 1,2-dibromo-3-chloropropane dichlorodiflouromethane, trichoroflouromethane Tracking Parameters: chloride, carbonate alkalinity(CO3), bicarbonate alkalinity, sulfate (SO4), calcium, magnesium, potassium, sodium, iron	(See Figure 1) **QUARTERLY EVALUATIONS:** **Detection Monitoring Performance Criteria for Primary Constituents** Concentrations of Primary Constituents in each well will be compared to the approved reporting limits specified in Appendix B of the SAP. **-Performance criteria have been met if measured concentrations of all constituents in all wells are less than their upper prediction limit (UPL) or respective reporting limit if a UPL is not specified.** -Performance criteria are not being met if the measured concentration of a constituent in any well is **equal to or greater than**Performance Criteria.-Resample the well for the Primary Constituent in question, as soon as practicable but with at least two weeks in between the original event and re-sampling event. The confirmation sample should be collected in duplicate. **Confirmation that Performance Criteria are not met for Primary Constituents** It is confirmed that performance criteria are not met for a Primary Constituent if atleast one of the two confirmation sample results are above the performance criterion. **Determine Statistically Significant Increase for a Tracking Parameter** Temporal Stiff diagrams will evaluate relative percent difference for each of the compounds on the chart from previous monitoring period to current. Statistically significant increases will be recognized by at least three consecutive quarterly temporal diagrams showing the same sequential pattern, or a long term change in concentration that is defined by a consistent 25% or more increase per monitoring period for two years for any individual Tracking Parameter. Note: for temporal Stiff diagram evaluations, non-detect values will be considered at the reporting limit. See Appendix H for description of using Stiff diagrams for chemical evaluation. **Statistically Significant Increase Confirmation for Tracking Parameter** The Tracking Parameter is confirmed if confirmation sampling results indicate the same temporal stiff plot sequential pattern or result in a 50% or more increase per year in average concentration over time over a period of four monitoring events. **ANNUAL EVALUATIONS:** - A narrative summary of groundwater Primary Constituent and Tracking Parameter results, including Tracking Parameter trends. *Note: SWLs measured as part of the chemical monitoring shall be used for quality control purposes only and not as part of the hydraulic monitoring program.
	3796A	Well						
	3856	Well						
	3858	Well						
	3860	Well						
	3862	Well						
	C7-231	Well						
	C7-241	Well						
	C7-251	Well						
	C7-261	Well						
	C7-271	Well						
	C8-210	Well						
	C9-239	Well						
	C9-251	Well						
	C9-278	Well						
	C9-296	Well						
	8614B	Well						
	2708	Well						
	3011	Well						
	3013	Well						
	8264G	Well	Annually					
	8264I	Well						
	8265F	Well						
	8265G	Well						

Table 2-A. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Glacial Till and Regional Aquifer Hydraulic Monitoring							
2708	Well						(See Figure 1) **ANNUAL EVALUATIONS:** **<u>Hydraulic Monitoring Evaluations:</u>** - Use SWL data to develop a contour map of the pieziometric surface and determine the hydraulic gradient in the Regional Aquifer. - Calculate groundwater flow rate in the Regional Aquifer. - Confirm upward gradient from the Regional Aquifer to the sand subunits in the Glacial Till using the well groupings identified on Figure 1.
2745	Well						
3065	Well						
3066	Well						
3137	Well						
3138	Well						
3795	Well						
3859	Well						
3861	Well						
5220	Well						
5232	Well						
5266	Well						
3794	Well						
3796A	Well	Quarterly	Yes	None	None	None	
3856	Well						
3858	Well						
3860	Well						
3862	Well						
2438	Well						
3013	Well						
3011	Well						
C7 - 271	Well						
C8 - 210	Well						
C9 - 296	Well						
8614B	Well						
8264I	Well						
8265G	Well						

Table 2-B. Sample Collection Chart

<table>
<tr><th></th><th>Identifier</th><th>Site Info.</th><th>Frequency</th><th>SWL?</th><th>Field Parameters</th><th>Analysis Parameters</th><th>Specific Constituents</th><th>Data Evaluation/Response</th></tr>
<tr><td colspan="9">East-Side RGIS - Chemical Monitoring</td></tr>
<tr><td rowspan="9"></td><td>LS-101</td><td>Sump</td><td rowspan="9">Target lists sampled annually. Every five years sample for 40 CFR 264, Appendix IX</td><td rowspan="9">No</td><td rowspan="9">None</td><td rowspan="9">VOA, EOA, METALS (filtered), D/F</td><td rowspan="9">benzene,
bromochloromethane,
chlorobenzene,
chloroform,
1,2-dibromoethane,
1,2-dichlorobenzene,
1,3-dichlorobenzene,
1,4-dichlorobenzene,
1,1-dichloroethane,
1,2-dichloroethane,
cis-1,2-dichloroethene,
dibromomethane
dichloromethane,
1,2-Dichloropropane,
1,4-dioxane,
ethylbenzene,
tetrachloroethene,
1,1,2-Trichloroethane
1,2,4-trichlorobenzene,
trichloroethene,
vinyl chloride,
m- & p-xylene,
bis(2-chloroethyl)ether,
t-butyl phenol
2-chlorophenol,
2,4-dichlorophenol,
2,6-dichlorophenol,
hexachlorobenzene,
hexachlorobutadiene,
naphthalene,
pentachlorophenol,
pentachlorobenzene,
phenol,
o-phenyl phenol,
4-tert-butylphenol,
1,2,4,5-tetrachlorobenzene
2,3,4,6-tetrachlorophenol,
2,4,6-trichlorophenol,
arsenic,
lithium,
(2,3,7,8-substituted dioxins and furans)17 isomers and 2,3,7,8-TCDD TEQ, using WHO-TEF</td><td rowspan="9">(See Figure 2)

Record volume of flow on a monthly basis and provide to Environmental Great Lakes and Energy (EGLE).

ANNUAL EVALUTIONS:
Trend charts will be used to evaluate changes in groundwater quality over time.

Performance Summary: The licensee shall submit a summary of maintenance activities from the previous year and a performance evaluation of the RGIS, including trend evaluation(s) of water quality over time, average monthly flow and volumes of water removed from each lift station as well as long-term trend evaluations of water levels from the RGIS piezometers.

TARGET LIST EVALUATIONS:
Every five years (beginning in 2006) sample lift stations for 40 CFR Part 264 Appendix IX list. Re-evaluate annual list by comparing with results of 40 CFR Part 264 Appendix IX testing.

Results of chemical monitoring are submitted according to Condition II.I.3.</td></tr>
<tr><td>LS-102</td><td>Sump</td></tr>
<tr><td>LS-3</td><td>Sump</td></tr>
<tr><td>LS-4</td><td>Sump</td></tr>
<tr><td>LS-5</td><td>Sump</td></tr>
<tr><td>LS-6</td><td>Sump</td></tr>
<tr><td>LS-7</td><td>Sump</td></tr>
<tr><td>LS-8</td><td>Sump</td></tr>
<tr><td>Deep Well 5964</td><td>Purge Well</td></tr>
</table>

Table 2-B. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
East-Side RGIS - Hydraulic Monitoring							
Compare to Upper River Level							
9006	Cluster 101A Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)	Yes	None	None	None	**2-DAY EVALUATIONS:** **Automated Piezometer Static Water Levels** A flow sheet describing the data evaluation and reporting requirements for the RGIS is provided in Figure 4. 12-hour average and instantaneous (real-time) static water level data from the automated primary piezometers, which are collected and compiled by computer, shall be compared to the Upper River Level within two business days. **Pro-Active Response Performance Criteria** -Pro-Active Response Performance criteria are being met if the instantaneous (real-time) static water levels in the primary piezometers are below the instantaneous (real-time) Upper River Level by two feet or more. -Performance criteria are not being met if the instantaneous (real-time) water levels in the primary piezometer are below but within two feet of the instantaneous (real-time) Upper River Level. Immediately initiate Proactive Response activities defined in Condition IX.D.2.(a).(vi). **Initial Response Performance Criteria** -Initial Response Performance criteria are being met if the 12-hour average static water levels in the primary piezometers are below the 12-hour average Upper River Level. -Performance criteria are not being met if the 12-hour average static water levels in the primary piezometers are equal to or greater than the 12-hour average Upper River Level. Immediately begin Initial Response activities defined in Condition IX.D.2.(a).(vii). **QUARTERLY EVALUATIONS:** Summarize the 12-hour average automated hydraulic data using trend charts. Summarize response information for the quarter. **Automated Piezometer Calibration** The licensee shall collect static water level measurements manually at each primary piezometer at the frequency specified in order to calibrate the automatically collected static water level. The automatically collected primary piezometer static water level is calibrated if the instantaneous static water level is within six inches of the manually collected static water level.
9008	Cluster 101C Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
9010	Cluster 102A Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
6533	Cluster AZ Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
6537	Cluster BA Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
9113	Cluster 3B Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
6107	Cluster AW Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
9012	Cluster 102A Deep Piezo	Manually once per quarter	Yes	None	None	None	**2-DAY EVALUATIONS:** **Manual Piezometer Static Water Levels** Manual static water level data from the deep piezometers shall be compared to the Upper River Level within two working days. **Initial Response Performance Criteria** -Initial Response Performance criteria are being met if the manual static water levels in the deep piezometers are below the instantaneous (real-time) Upper River Level. -Performance criteria are not being met if the manual static water levels in the deep piezometers are equal to or greater than the instantaneous (real-time) Upper River Level. Immediately begin Initial Response activities defined in Condition IX.D.2.(a).(vii). **QUARTERLY EVALUATIONS:** Summarize the manual static water level data using trend charts. Summarize response information for the quarter.
6535	Cluster AZ Deep Piezo	Manually once per quarter					

Table 2-B. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
East-Side RGIS - Hydraulic Monitoring (Continued)							
Compare to Lower River Level							
6110	Cluster AV Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)	Yes	None	None	None	**2-DAY EVALUATIONS:** **<u>Automated Piezometer Static Water Levels</u>** A flow sheet describing the data evaluation and reporting requirements for the RGIS is provided in Figure 4. 12-hour average and instantaneous (real-time) static water level data from the automated primary piezometers, which are collected and compiled by computer, shall be compared to the Lower River Level within two business days. **<u>Pro-Active Response Performance Criteria</u>** -Pro-Active Response Performance criteria are being met if the instantaneous (real-time) static water levels in the primary piezometers are below the instantaneous (real-time) Lower River Level by two feet or more. -Performance criteria are not being met if the instantaneous (real-time) water levels in the primary piezometer are below but within two feet of the instantaneous (real-time) Lower River Level. Immediately initiate Proactive Response activities defined in Condition IX.D.2.(a).(v). **<u>Initial Response Performance Criteria</u>** -Initial Response Performance criteria are being met if the 12-hour average static water levels in the primary piezometers are below the 12-hour average Lower River Level. -Performance criteria are not being met if the 12-hour average static water levels in the primary piezometers are equal to or greater than the 12-hour average Lower River Level. Immediately begin Initial Response activities defined in Condition IX.D.2.(a).(vii). **QUARTERLY EVALUATIONS:** Summarize the 12-hour average automated hydraulic data using trend charts. Summarize response information for the quarter. **<u>Automated Piezometer Calibration</u>** The licensee shall collect static water level measurements manually at each primary piezometer at the frequency specified in order to calibrate the automatically collected static water level. The automatically collected primary piezometer static water level is calibrated if the instantaneous static water level is within six inches of the corresponding manually collected static water level.
6113	Cluster AU Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5510	Cluster Y Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5992	Cluster AP Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5513	Cluster Z Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5516	Cluster AA Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5988	Cluster AO Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5984	Cluster AN Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5980	Cluster AM Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5977	Cluster AL Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5974	Cluster AK Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					
5971	Cluster AJ Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					

Table 2-B. Sample Collection Chart

<table>
<tr><th>Identifier</th><th>Site Info.</th><th>Frequency</th><th>SWL?</th><th>Field Parameters</th><th>Analysis Parameters</th><th>Specific Constituents</th><th>Data Evaluation/Response</th></tr>
<tr><td colspan="8">East-Side RGIS - Hydraulic Monitoring (Continued)</td></tr>
<tr><td>5682</td><td>Cluster AB Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td><td rowspan="9">Yes</td><td rowspan="9">None</td><td rowspan="9">None</td><td rowspan="9">None</td><td rowspan="9">2-DAY EVALUATIONS:

<u>Automated Piezometer Static Water Levels</u>
A flow sheet describing the data evaluation and reporting requirements for the RGIS is provided in Figure 4. 12-hour average and instantaneous (real-time) static water level data from the automated primary piezometers, which are collected and compiled by computer, shall be compared to the Lower River Level within two business days.

<u>Pro-Active Response Performance Criteria</u>
-Pro-Active Response Performance criteria are being met if the instantaneous (real-time) static water levels in the primary piezometers are below the instantaneous (real-time) Upper Lower River Level by two feet or more.
-Performance criteria are not being met if the instantaneous (real-time) water levels in the primary piezometer are below but within two feet of the instantaneous (real-time) Lower River Level. Immediately initiate Proactive Response activities defined in Condition IX.D.2.(a).(v).

<u>Initial Response Performance Criteria</u>
-Initial Response Performance criteria are being met if the 12-hour average static water levels in the primary piezometers are below the 12-hour average Lower River Level.
-Performance criteria are not being met if the 12-hour average static water levels in the primary piezometers are equal to or greater than the 12-hour average Lower River Level. Immediately begin Initial Response activities defined in Condition IX.D.2.(a).(vii).

QUARTERLY EVALUATIONS:
Summarize the 12-hour average automated hydraulic data using trend charts.
Summarize response information for the quarter.

<u>Automated Piezometer Calibration</u>
The licensee shall collect static water level measurements manually at each primary piezometer at the frequency specified in order to calibrate the automatically collected static water level. The automatically collected primary piezometer static water level is calibrated if the instantaneous static water level is within six inches of the corresponding manually collected static water level.</td></tr>
<tr><td>5771</td><td>Cluster AC Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td></tr>
<tr><td>5774</td><td>Cluster AD Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td></tr>
<tr><td>5951</td><td>Cluster AG Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td></tr>
<tr><td>5954</td><td>Cluster AH Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td></tr>
<tr><td>5957</td><td>Cluster AI Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td></tr>
<tr><td>5832</td><td>Cluster AE Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td></tr>
<tr><td>5835</td><td>Cluster AF Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td></tr>
<tr><td>6197</td><td>Cluster AX Primary Piezo (Automated)</td><td>Continuously (manually once per quarter for calibration)</td></tr>
<tr><td>5990</td><td>Cluster AO Deep Piezo</td><td>Manually once per quarter</td><td rowspan="3">Yes</td><td rowspan="3">None</td><td rowspan="3">None</td><td rowspan="3">None</td><td rowspan="3">2-DAY EVALUATIONS:

<u>Manual Piezometer Static Water Levels</u>
Manual static water level data from the deep piezometers shall be compared to the Lower River Level within two working days.

<u>Initial Response Performance Criteria</u>
-Initial Response Performance criteria are being met if the manual static water levels in the deep piezometers are below the instantaneous (real-time) Lower River Level.
-Performance criteria are not being met if the manual static water levels in the deep piezometers are equal to or greater than the instantaneous (real-time) Lower River Level. Immediately begin Initial Response activities defined in Condition IX.D.2.(a).(vii).

QUARTERLY EVALUATIONS:
Summarize the manual static water level data using trend charts.
Summarize response information for the quarter.</td></tr>
<tr><td>5985</td><td>Cluster AN Deep Piezo</td><td>Manually once per quarter</td></tr>
<tr><td>5981</td><td>Cluster AM Deep Piezo</td><td>Manually once per quarter</td></tr>
</table>

Table 2-B. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
East-Side RGIS - Hydraulic Monitoring (Continued)							
Cluster AT							
6005	Cluster AT Outboard Piezo (Automated)	Continuously (manually once per quarter for calibration)	Yes	None	None	None	2-DAY EVALUATIONS: Automated Piezometer Static Water Levels A flow sheet describing the data evaluation and reporting requirements for the RGIS is provided in Figure 4. Cluster AT is located along the southern portion of the RGIS that is parallel to Saginaw Road, and therefore cannot be compared to the river level. The 12-hour average static water level in the primary piezometer will be compared to the 12-hour average static water level in the corresponding outboard piezometer within two business days. The instantaneous (real-time) static water level in the primary piezometer will be compared to the instantaneous (real-time) static water level in the corresponding outboard piezometer within two business days. Pro-Active Response Performance Criteria -Pro-Active Response Performance criteria are being met if the instantaneous (real-time) static water level in the primary piezometer is below the instantaneous (real-time) static water level in the corresponding outboard piezometer by two feet or more. -Performance criteria are not being met if the instantaneous (real-time) static water level in the primary piezometer is below but within two feet of the instantaneous (real-time) static water level in the corresponding outboard piezometer. Immediately initiate Proactive Response activities defined in Condition IX.D.2.(a).(v). Initial Response Performance Criteria -Performance criteria are being met if the 12-hour average static water level in the primary piezometer is below the 12-hour average static water level in the corresponding outboard piezometer. -Performance criteria are not being met if the 12-hour average static water level in the primary piezometer is equal to or greater than the 12-hour average static water level in the corresponding outboard piezometer. Immediately begin Initial Response activities defined in Condition IX.D.2.(a).(vii). QUARTERLY EVALUATION: Summarize the 12-hour average automated hydraulic data using trend charts. Summarize response information for the quarter. Automated Piezometer Calibration The licensee shall collect static water level measurements manually at the primary and outboard piezometers at the frequency specified in order to calibrate the automatically collected static water levels. The automatically collected static water levels are calibrated if the instantaneous static water levels are within six inches of the manually collected static water levels.
6006	Cluster AT Primary Piezo (Automated)	Continuously (manually once per quarter for calibration)					

Table 2-C. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
West-Side RGIS Chemical Monitoring								
	LS-109	Sump	Annually	No	None	VOA, METALS (filtered), SULFATE, D/F	1,2-dibromoethane, 1,2-dichloroethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, benzene, chlorobenzene, vinyl chloride, barium, nickel, sulfate, (2,3,7,8-substituted dioxins and furans) 17 isomers and 2,3,7,8-TCDD TEQ, using WHO-TEF for reporting)	(See Figure 3) Record volume of flow on a monthly basis and provide to EGLE. ANNUAL EVALUATIONS: Trend charts will be used to evaluate changes in groundwater quality over time. Performance Summary: The licensee shall submit a summary of maintenance activities from the previous year and a performance evaluation of the RGIS, including trend evaluation(s) of water quality over time, average monthly flow and volumes of water removed from each lift station as well as long-term trend evaluations of water levels from the RGIS piezometers. TARGET LIST EVALUATIONS: Every five years (beginning in 2010) sample lift stations for 40 CFR Part 264 Appendix IX list. Re-evaluate annual list by comparing with results of 40 CFR Part 264 Appendix IX testing. Results of chemical monitoring are submitted according to Condition II.I.3.
	LS-120	Sump						

Table 2-C. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
West-Side RGIS - Hydraulic Monitoring							
Compare Primary versus Outboard Piezometers							
5218	Cluster T-A Inboard Piezo	Once per month - manually	Yes	None	None	None	**7-DAY EVALUATIONS:** **<u>Hydraulic Evaluation</u>** Manually collected static water levels in primary piezometers shall be compared to the manual static water levels in the corresponding outboard piezometers within ***7 calendar days*** of the collection of the hydraulic data. **<u>Initial Response Performance Criteria</u>** -Performance criteria are being met if the manual static water levels in the primary piezometers are below the manual static water levels in the corresponding outboard piezometers (drawdown to primary), or if the corresponding outboard piezometer is in a "dry" condition. -Performance criteria are not being met if the manual static water levels in the primary piezometers are equal to or greater than the manual static water levels in the corresponding outboard piezometer. Immediately begin Initial Response activities defined in Condition X.D.3.(a).(ii).(3). **QUARTERLY EVALUATIONS:** Summarize manually collected hydraulic data a in table, including piezometer identification, identification of primary piezometers, date of data collection, USGS water elevation for each piezometer.
5219	Cluster T-A Primary Piezo						
5220	Cluster T-A Outboard Piezo						
5221	Cluster T-B Inboard Piezo						
5222	Cluster T-B Primary Piezo						
5224	Cluster T-B Outboard Piezo						
5225	Cluster T-C Inboard Piezo						
5226	Cluster T-C Primary Piezo						
5228	Cluster T-C Outboard Piezo						
5229	Cluster T-D Inboard Piezo						
5230	Cluster T-D Primary Piezo						
5232	Cluster T-D Outboard Piezo						
5236	Cluster T-F Inboard Piezo						
5238	Cluster T-F Primary Piezo						
5240	Cluster T-F Outboard Piezo						
5241	Cluster T-G Inboard Piezo						
5242	Cluster T-G Inboard Piezo						
5243	Cluster T-G Primary Piezo						
5245	Cluster T-G Outboard Piezo						

Table 2-C. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
West-Side RGIS - Hydraulic Monitoring (Continued)								
	5246	Cluster T-H Inboard Piezo	Once per month - manually	Yes	None	None	None	(same as above)
	5247	Cluster T-H Primary Piezo						
	5249	Primary T-H Outboard Piezo						
	5254	Cluster T-J Inboard Piezo						
	5255	Cluster T-J Primary Piezo						
	4823	Cluster T-J Outboard Piezo						
	8572	Cluster BB Outboard Piezo						
	8574	Cluster BB Inboard Piezo						
	8573	Cluster BB Primary Piezo						
	8575	Cluster BC Outboard Piezo						
	8576	Cluster BC Primary Piezo						
	8577	Cluster BC Inboard Piezo						
	4013	Cluster U Inboard Piezo						
	5253	Cluster U Inboard Piezo						
	5258	Cluster U Primary Piezo (Automated)	Continuously (manually once per month)					
	5259	Cluster U Outboard Piezo (Automated)	Once per month - manually					

Table 2-C. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
West-Side RGIS - Hydraulic Monitoring (Continued)								
	4012	Cluster V Inboard Piezo	Once per month - manually	Yes	None	None	None	(same as above)
	5260	Cluster V Primary Piezo (Automated)	Continuously (manually once per month)					
	5262	Cluster V Outboard Piezo	Once per month - manually					
	5263	Cluster W Inboard Piezo						
	5264	Cluster W Primary Piezo (Automated)	Continuously (manually once per month)					
	5266	Cluster W Outboard Piezo	Once per month - manually					
	5267	Cluster X Inboard Piezo						
	5268	Cluster X Primary Piezo (Automated)	Continuously (manually once per month)					
	5269	Cluster X Outboard Piezo	Once per month - manually					
	3977	Cluster AY Outboard Piezo						
	3978	Cluster AY Outboard Piezo						
	6192	Cluster AY Primary Piezo						
	3979	Cluster AY Inboard Piezo						
	3980	Cluster AY Inboard Piezo						

Table 2-C. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
West-Side RGIS - Hydraulic Monitoring (Continued)							
Compare Primary Piezometer to Bullock Creek							
5233	Cluster T-E Inboard Piezo	Once per month - manually	Yes	None	None	None	**<u>7-DAY EVALUATIONS:</u>** **<u>Hydraulic Evaluation</u>** Compare manual static water levels in primary piezometers to the manual static water levels in the corresponding outboard piezometers and Bullock Creek water level within ***7 calendar days*** of the collection of the hydraulic data. **<u>Initial Response Performance Criteria</u>** -Performance Criteria are being met if the manual static water level in the primary piezometer is below the manual static water level in the corresponding outboard piezometer or the manual static water level in the primary piezometer is lower than Bullock Creek. -Performance criteria are not being met if the manual static water level in the primary piezometer is equal to or greater than the manual static water level in the corresponding outboard piezometer and Bullock Creek. Immediately begin Initial Response activities defined in Condition IX.D.3.(a).(ii).(3). **QUARTERLY EVALUATIONS:** Same as page 2 of this table.
5234	Cluster T-E Primary Piezo						
5235	Cluster T-E Outboard Piezo						
Compare Inboard and Outboard Piezometers							
4965	Cluster T-I Inboard Piezo	Once per month - manually	Yes	None	None	None	**7-DAY EVALUATIONS:** **<u>Hydraulic Evaluation</u>** Compare manual static water levels in corresponding outboard and inboard piezometers within ***7 calendar days*** of the collection of the hydraulic data. **<u>Initial Response Performance Criteria</u>** -Performance criteria are being met if the manual static water level in 5252 (outside of sheet piling) is below the manual static water level in 5257 (inside of sheet piling). -Performance criteria are not being met if the manual static water level in 5252 is greater than or equal to the manual static water level in 5257. Immediately begin Initial Response activities defined in Condition X.D.3(a)(ii)(3). **QUARTERLY EVALUATIONS:** Same as page 2 of this table.
4965A	Cluster T-I Inboard Piezo						
5250	Cluster T-I Inboard Piezo						
5252	Cluster T-I Outboard Piezo						
5257	Cluster T-I Outboard Piezo						
Lift Station 109 Piezos - Compare to Lower River Level							
8862	Cluster 109A Primary Piezo	Once per month - manually	Yes	None	None	None	**7-DAY EVALUATIONS:** **<u>Hydraulic Evaluation</u>** Compare manual static water levels in the primary piezometers and the outboard piezometer to the Lower River Level within ***7 calendar days*** of the collection of the hydraulic data. **<u>Initial Response Performance Criteria</u>** -Performance criteria are being met if the manual static water levels in the primary and outboard piezometers are below the instantaneous (real-time) Lower River Level. -Performance criteria are not being met if the manual static water levels in the primary and outboard piezometers are greater than or equal to the instantaneous (real-time) Lower River Level. Immediately begin Initial Response activities defined in Condition IX.D.3.(a).(ii).(3). **QUARTERLY EVALUATIONS:** Same as page 2 of this table.
6170	Cluster 109A Outboard Piezo						

Table 2-C. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
West-Side RGIS - Hydraulic Monitoring (Continued)							
Lift Station 109 Piezos - Compare Inboard and Outboard Piezometers							
8864	Cluster 109B Primary Piezo	Once per month - manually	Yes	None	None	None	**7-DAY EVALUATIONS:** **Hydraulic Evaluation** Compare manual static water levels in corresponding outboard and inboard piezometers within ***7 calendar days*** of the collection of the hydraulic data. **Initial Response Performance Criteria** -Performance criteria are being met if the manual static water level in the primary piezometer is below the manual static water level in the corresponding outboard piezometer (drawdown to primary), or if the corresponding outboard piezometer is in a "dry" condition. -Performance criteria are not being met if the manual static water level in the primary piezometer is equal to or greater than the manual static water level in the corresponding outboard piezometer. Immediately begin Initial Response activities defined in Condition IX.D.3.(a).(ii).(3). **QUARTERLY EVALUATIONS:** Same as page 2 of this table.
8863	Cluster 109B Outboard Piezo						
8866	Cluster 109D Primary Piezo		Yes	None	None	None	
8865	Cluster 109D Outboard Piezo						

Table 2-D. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
6 Pond Collection Tile System LS-11 Chemical Monitoring								
	LS-11	Sump	Annually	No	None	VOA, METALS (filtered), SULFATE, D/F	1,2-dibromoethane, 1,2-dichloroethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, benzene, chlorobenzene, vinyl chloride, barium, nickel, sulfate, (2,3,7,8-substituted dioxins and furans) 17 isomers and 2,3,7,8-TCDD TEQ, using WHO-TEF for reporting)	(See Figure 3) **ANNUAL EVALUATIONS:** Groundwater quality over time will be evaluated by creating trend charts. Performance Summary: The licensee shall submit a summary of maintenance activities from the previous year and a performance evaluation of the RGIS, including the trend evaluation(s) of water quality over time, average monthly flow and volumes of water removed from each lift station as well as long-term trend evaluations of water levels from the piezometers. **TARGET LIST EVALUATIONS:** Every five years (beginning in 2010) sample lift stations for 40 CFR Part 264 Appendix IX list. Re-evaluate annual list by comparing with results of 40 CFR Part 264 Appendix IX testing. Results of chemical monitoring are submitted according to Condition II.I.3.
6 Pond Collection Tile System LS-11 Area Hydraulic Monitoring								
	3975	Cluster R Outboard Piezo	Monthly	Yes	None	None	None	(See Figure 5a) Record volume of flow on a monthly basis and provide to EGLE. 7-DAY EVALUATIONS: Hydraulic Evaluation Manually collected static water levels in primary piezometers shall be compared to the manual static water levels in the corresponding outboard piezometers within 7 calendar days of the collection of the hydraulic data. Initial Response Performance Criteria -Performance criteria are being met if the manual static water levels in the primary piezometers are below the manual static water levels in the corresponding outboard piezometers (drawdown to primary), or if the outboard piezometer is in a "dry" condition. -Performance criteria are not being met if the manual static water levels in the primary piezometers are equal to or greater than the manual static water levels in the corresponding outboard piezometers. Immediately begin Initial Response activities defined in Condition IX.D.4.(a).(ii).(3). QUARTERLY EVALUATIONS: Summarize manually collected hydraulic data in a table, including piezometer identification, identification of primary piezometers, date of data collection, USGS water elevation for each piezometer.
	6194	Cluster R Primary Piezo						
	4787	Cluster R Inboard Piezo						
	3983	Cluster S Outboard Piezo						
	6193	Cluster S Primary Piezo						
	3985A	Cluster S Inboard Piezo						
	3985B	Cluster S Inboard Piezo						
	3986A	Cluster S Inboard Piezo						
	3986B	Cluster S Inboard Piezo						

Table 2-D. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
6 Pond Collection Tile System LS-12 Area Hydraulic Monitoring								
	8579	Cluster BD Primary Piezo	Monthly	Yes	None	None	None	(See Figure 3) **7-DAY EVALUATIONS:** **<u>Hydraulic Evaluation</u>** Manually collected static water levels in primary piezometers shall be compared to the manual static water levels in the corresponding outboard piezometers within ***7 calendar days*** of the collection of the hydraulic data. **<u>Initial Response Performance Criteria</u>** -Performance criteria are being met if the manual static water levels in the primary piezometers are below the manual static water levels in the corresponding outboard piezometers (drawdown to primary), or if the corresponding outboard piezometer is in a "dry" condition. -Performance criteria are not being met if the manual static water levels in the primary piezometers are equal to or greater than the manual static water levels in the corresponding outboard piezometers. Immediately begin Initial Response activities defined in Condition IX.D.4.(a).(ii).(3). **QUARTERLY EVALUATIONS:** Summarize manually collected hydraulic data in a table, including piezometer identification, identification of primary piezometers, date of data collection, USGS water elevation for each piezometer.
	8599	Cluster BD Outboard Piezo						
	8580	Cluster BE Primary Piezo						
	4586	Cluster BE Outboard Piezo						
	8578	Cluster BF Primary Piezo						
	8598	Cluster BF Outboard Piezo						

Table 2-D. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
6 Pond Collection Tile System LS-14 Area Hydraulic Monitoring								
	8721	Cluster BG Primary Piezo	Monthly	Yes	None	None	None	(See Figure 3) **7-DAY EVALUATIONS:** **Hydraulic Evaluation** Manually collected static water levels in primary piezometers shall be compared to the manual static water levels in the corresponding outboard piezometers within ***7 calendar days*** of the collection of the hydraulic data. **Initial Response Performance Criteria** -Performance criteria are being met if the manual static water levels in the primary piezometers are below the manual static water levels in the corresponding outboard piezometers (drawdown to primary), or if the outboard piezometer is in a "dry" condition. -Performance criteria are not being met if the manual static water levels in the primary piezometers are equal to or greater than the manual static water levels in the corresponding outboard piezometers. Immediately begin Initial Response activities defined in Condition IX.D.4.(a).(ii).(3). **QUARTERLY EVALUATIONS:** Summarize manually collected hydraulic data in a table, including piezometer identification, identification of primary piezometers, date of data collection, USGS water elevation for each piezometer.
	8722	Cluster BG Outboard Piezo						
	8723	Cluster BH Primary Piezo						
	8724	Cluster BH Outboard Piezo						
	8725	Cluster BI Primary Piezo						
	8726	Cluster BI Outboard Piezo						
	8727	Cluster BJ Primary Piezo						
	8728	Cluster BJ Outboard Piezo						
	8729	Cluster BK Primary Piezo						
	8730	Cluster BK Outboard Piezo						

Table 2-E. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
River Corrective Action Chemical Monitoring								
	Sand Bar Lift Station	Horizontal Well	Annually	No	None	VOA	Primary Constituents: benzene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene	(See Figure 5 and 6) **ANNUAL EVALUATIONS:** Trend charts will be used to evaluate changes in groundwater quality over time. Performance Summary: The licensee shall submit a summary of maintenance activities from the previous year and a performance evaluation of the lift station, including trend evaluation(s) of water quality over time, as well as long-term trend evaluations of water levels from the piezometer (5678). Results of chemical monitoring are submitted according to Condition II.I.3.
River Corrective Action Hydraulic Monitoring								
	5678	Automated Piezo	Continuously (manually once per quarter)	Yes	None	None	None	(See Figure 5 and 6) **2-DAY EVALUATIONS:** **Automated Piezometer Static Water Levels** 12-hour average and instantaneous (real-time) static water level data from the automated piezometer, which are collected and compiled by computer, shall be compared to the Lower River Level within two business days. **Initial Response Performance Criteria (normal river level conditions)** - Initial Response Performance criteria are being met under normal river level conditions if the 12-hour average static water levels in the primary piezometers are below the 12-hour average Lower River Level. - Initial Response Performance criteria are not being met under normal river level conditions if the 12-hour average static water levels in the primary piezometers are above the 12-hour average Lower River Level. Immediately begin Initial Response activities defined in Condition IX.D.5.(a).(iv). **Initial Response Performance Criteria (high river level conditions)** A high river level condition is occurring when a portion of the Sand Bar surrounded by the sheet piling is partially or completely submerged by river water. During and immediately following high river level conditions, the instantaneous water level in the monitoring well may exceed or be equal to the river level. -Performance criteria are being met during or immediately following a high river level event if the instantaneous water levels in the piezometer are consistently decreasing, after the river level has receded below the down river edge of the sheet piling. -Performance criteria are not being met during or immediately following a high river level event if the instantaneous water levels in the piezometer do not decrease after the river level has receded below the down river edge of the sheet piling. Immediately begin Initial Response activities defined in Condition IX.D.5.(a).(iv). **QUARTERLY EVALUATIONS:** Summarize the 12-hour average automated hydraulic data using trend charts. Summarize response information for the quarter. The licensee shall develop typical hydraulic profiles of the static water elevations on a quarterly basis comparing the water level elevation in Monitoring Well 5678 to the Lower River level. **Automated Piezometer Calibration** The licensee shall collect static water level measurements manually at each primary piezometer at the frequency specified in order to calibrate the automatically collected static water level. The automatically collected primary piezometer static water level is calibrated if the instantaneous static water level is within six inches of the manually collected static water level.

Table 2-F. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
7th Street Purge Well Area Hydraulic Monitoring Program							
4175A	Piezo	Monthly, or in response to a problem identified via inspection or automated alarm	Yes	None	None	None	(See Figure 7) Record volume of flow on a monthly basis and provide to EGLE. 7-DAY EVALUATIONS: Hydraulic Evaluation Static water level data will be converted to U.S.G.S. datum elevations and a contour of the potentiometric surface elevation will be produced. The contour map will be evaluated within seven calendar days of taking the manual readings to determine if groundwater at the site is being captured by the purge wells (preventing upland groundwater from flowing to the Tittabawassee River). Initial Response Criteria -Performance Criteria are being met if water levels indicate gradient toward the purge wells. -Performance criteria are not being met if water levels do not indicate that the gradient is toward the purge wells, and the effective operation of the purge wells cannot be confirmed (preventing upland groundwater from flowing to the river). Begin Initial Reponses activities defined in Condition IX.D.6(a). QUARTERLY EVALUATION: Summarize manually collected hydraulic data in table, including piezometer identification, date of data collection, USGS water elevation for river and each piezometer. Include contour map in quarterly report. ANNUAL EVALUATION: Summarize the year's data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph).
3863A	Piezo						
3706	Piezo						
4179A	Piezo						
3708	Piezo						
3549A	Piezo						
3693	Piezo						
4181	Piezo						
6170	Piezo						
4183	Piezo						

Table 2-F. Sample Collection Chart

<table>
<tr><th></th><th>Identifier</th><th>Site Info.</th><th>Frequency</th><th>SWL?</th><th>Field Parameters</th><th>Analysis Parameters</th><th>Specific Constituents</th><th>Data Evaluation/Response</th></tr>
<tr><td colspan="9">7th Street Purge Well Area Chemical Monitoring Program</td></tr>
<tr><td rowspan="5"></td><td>PW-1</td><td>Purge Well</td><td rowspan="5">Annually</td><td rowspan="5">No</td><td rowspan="5">Temp, pH, Conductivity, ORP, DO, Turbidity</td><td rowspan="5">VOA, EOA, CYAN, METALS (filtered), CARBS, CHLORIDE</td><td rowspan="5"><u>Primary Constituents</u>:
VOAs:
1,1,1-trichloroethane
1,1-dichloroethene
1,1-dichloroethane
1,2,4-trimethylbenzene
1,2-dichlorobenzene
1,2-dichloropropane
1,3,5-trimethylbenzene
1,4-dichlorobenzene
benzene
bromodichloromethane
bromomethane
2-butanone
carbon disulfide
chlorobenzene
chloroethane
chloromethane
cis-1,2-dichloroethene
dichlorodifluoromethane
ethylbenzene
isopropylbenzene
n-propylbenzene
sec-butylbenzene
tetrachloroethene
tetrahydrofuran
toluene
trichloroethene
m-xylene
o-xylene
p-xylene
vinyl chloride
EOAs: 1-methylnaphthalene
2-methylnaphthalene
acenaphthene
anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
chrysene
fluoranthene
fluorene
naphthalene
phenanthrene
pyrene

<u>METALS/OTHER:</u>
cadmium
chromium
lead
arsenic
cyanide, total

(Reevaluate every 5 years with a 40 CFR Part 264 Appendix IX analysis of purge wells)</td><td rowspan="5">(See Figure 7)

<u>QUARTERLY EVALUATION:</u>

<u>Initial Response Performance Criteria</u>
-Initial Response Performance criteria are being met if the static water levels in the piezometers indicate that the gradient reversal is maintained, and there is no other indication that the purge well system is not functioning properly.
-Initial Response Performance criteria are not being met if the static water levels in the piezometers indicate a loss of gradient reversal, or other information indicates that the purge well system is not functioning property. Immediately begin Initial Response activities defined in Condition IX.D.6(a).

ANNUAL EVALUATION:

Trend charts will be used to evaluate changes in groundwater quality over time.
-Include in Operational Summary Report

TARGET LIST EVALUATION:
Every five years (beginning in 2015) sample purge wells for 40 CFR Part 264 Appendix IX list. Re-evaluate annual list by comparing with results of 40 CFR Part 264 Appendix IX testing.

Results of chemical monitoring are submitted according to Condition II.I.3.</td></tr>
<tr><td>PW-2</td><td>Purge Well</td></tr>
<tr><td>PW-3</td><td>Purge Well</td></tr>
<tr><td>PW-4</td><td>Purge Well</td></tr>
<tr><td>LS-121</td><td>Horizontal Well</td></tr>
</table>

Table 2-F. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
7th Street Purge Well Area Corrective Action Monitoring Program (Formerly known as "Six" Purge Wells)								
	MW-1	Monitoring Well	Quarterly	Yes	pH, Conductivity, Temperature, ORP, DO, Turbidity	VOA, EOA, CYAN, METALS (filtered), CARBS, CHLORIDE	**<u>Primary Constituents</u>**: VOAs: 1,1,1-trichloroethane 1,1-dichloroethene 1,1-dichloroethane 1,2,4-trimethylbenzene 1,2-dichlorobenzene 1,2-dichloropropane 1,3,5-trimethylbenzene 1,4-dichlorobenzene benzene bromodichloromethane bromomethane 2-butanone carbon disulfide chlorobenzene chloroethane chloromethane cis-1,2-dichloroethene dichlorodifluoromethane ethylbenzene isopropyl benzene n-propyl benzene sec-butyl benzene tetrachloroethene tetrahydrofuran toluene trichloroethene m-xylene o-xylene p-xylene vinyl chloride EOAs: 1-methylnaphthalene 2-methylnaphthalene acenaphthene anthracene benzo(a)pyrene benzo(b)fluoranthene benzo(ghi)perylene chrysene fluoranthene fluorene naphthalene phenanthrene pyrene DRO total **<u>METALS/OTHER:</u>** cadmium chromium lead bicarbonate alkalinity carbonate alkalinity chloride arsenic cyanide, total (Reevaluate every 5 years with a 40 CFR Part 264 Appendix IX analysis of purge wells)	(See Figure 7) **QUARTERLY EVALUATION:** **<u>Compliance Well Corrective Action Monitoring Performance Criteria</u>:** Concentration of constituents in compliance wells will be compared to the performance criteria values specified in Appendix J of the SAP. -Performance criteria are being met if the detected concentrations in all compliance wells are less or equal to their respective performance criteria value. -Performance criteria are not being met if the measured concentration of a constituent in any compliance well is greater than the respective performance criteria value. Resample the affected well for the constituent in question, as soon as practicable but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in quadruplicate. **<u>Confirmation that Performance Criteria are not being met:</u>** It is confirmed that the performance criteria are not being met if atleast two of the four confirmation sample results are above the performance criterion. **<u>Initial Response Performance Criteria</u>** -Initial Response Performance criteria are being met if the static water levels in the monitoring wells indicate that the gradient reversal is maintained, and there is no other indication that the purge well system is not functioning properly. -Initial Response Performance criteria are not being met if the static water levels in the monitoring wells indicate a loss of gradient reversal, or other information indicates that the purge well system is not functioning property. Immediately begin Initial Response activities defined in Condition IX.D.6(a). **TARGET LIST EVALUATION:** Every five years (beginning in 2015) sample purge wells for 40 CFR Part 264 Appendix IX list. Re-evaluate routine list by comparing with results of 40 CFR Part 264 Appendix IX testing.
	MW-6	Monitoring Well						
	MW-12	Monitoring Well						
	MW-14S	Compliance Monitoring Well						
	MW-15S	Compliance Monitoring Well						
	MW-16	Monitoring Well						
	MW-17	Compliance Monitoring Well						
	MW-18	Compliance Monitoring Well						

Table 2-G. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Ash Pond Area Corrective Action Monitoring								
	6165	Well	Quarterly	Yes	pH, Conductivity, Temperature, ORP, DO, Turbidity	VOA, EOA, DISSOLVED METALS (filtered)	VOAs: benzene, 1,4-dichlorobenzene, ethylbenzene, phenol, toluene, xylenes EOAs: 2-methylnaphthalene, Acenaphthene, fluorene naphthalene, phenanthrene METALS: boron, arsenic, lithium, selenium	(See Figure 8) **QUARTERLY EVALUATION:** **<u>Corrective Action Monitoring Performance Criteria for Primary Constituents</u>** Concentrations of Primary Constituents in each well will be compared to their performance criteria values, specified in Appendix J of the SAP. -Performance criteria have been met if measured concentrations of all constituents in all wells are less than their respective performance criteria values. -Performance criteria are not being met if the measured concentration of a constituent in any well is equal to or greater than the respective performance criteria value. Resample the well for the Primary Constituent in question, as soon as practicable but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in quadruplicate. **Confirmation that Performance Criteria are not being met:** It is confirmed that the performance criteria are not being met if atleast two of the four confirmation sample results are above the performance criterion. **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate).
	6166	Well						
	6167	Well						
	6168	Well						
	6169	Well						

Table 2-H. Sample Collection Chart

<table>
<tr><th></th><th>Identifier</th><th>Site Info.</th><th>Frequency</th><th>SWL?</th><th>Field Parameters</th><th>Analysis Parameters</th><th>Specific Constituents</th><th>Data Evaluation/Response</th></tr>
<tr><td colspan="9">Former 47 Building Area Monitoring</td></tr>
<tr><td rowspan="5"></td><td>F47-MW-10</td><td>Well</td><td>Quarterly hydraulic monitoring</td><td rowspan="5">Yes</td><td>None</td><td>None</td><td></td><td rowspan="5">(See Figure 11)

QUARTERLY EVALUATIONS:

<u>Hydraulic Monitoring Program Performance Criteria</u>
Static water level data will be converted to U.S.G.S. datum elevations and a contour of the water table elevation will be produced. Evaluate the contour map quarterly to determine if there are any areas of potential off-site groundwater migration.
-Performance criteria are being met if hydraulic data confirm that the direction of flow indicates that groundwater is being captured by northernmost leg of the RGIS.
-Performance criteria are not being met if hydraulic data indicate a potential for off-site groundwater migration.

ANNUAL EVALUATIONS:

Summarize the year's hydraulic data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph).

<u>Chemical Monitoring Performance Criteria</u>
Concentrations of Primary Constituents in each well sampled during that quarter will be compared to their performance criteria values, specified in Appendix J of the SAP.
-Performance criteria are being met if measured concentrations of all constituents are less than their respective performance criteria values.
-Performance criteria are not being met if a measured concentrations of a Primary Constituent is equal to or greater than the respective performance criteria value. As soon as practicable, schedule and perform confirmation re-sample of the affected well for the constituent in question, but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in duplicate.

Confirmation that Performance Criteria are not being met:
It is confirmed that the performance criteria are not being met if atleast one of the two confirmation sample results are above the performance criterion.</td></tr>
<tr><td>F47-MW-11</td><td>Well</td><td rowspan="2">Quarterly hydraulic monitoring/ Annual chemical monitoring</td><td rowspan="2">pH, Conductivity, Temperature, ORP, DO, Turbidity</td><td rowspan="2">VOA</td><td rowspan="2"><u>Primary Constituents</u>
dichlorodifluoromethane
1,2-dichloroethane
1,2-dichloropropane
tetrachloroethene</td></tr>
<tr><td>F47-MW-12</td><td>Well</td></tr>
<tr><td>F47-MW-13</td><td>Well</td><td>Quarterly hydraulic monitoring</td><td>None</td><td>None</td><td></td></tr>
<tr><td>F47-MW-14</td><td>Well</td><td>Quarterly hydraulic monitoring</td><td>None</td><td>None</td><td></td></tr>
</table>

Table 2-I. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Northeast Perimeter Corrective Action Monitoring							
5385	Well	Semiannual (2nd and 4th Quarters)	Yes	pH, Conductivity, Temperature, ORP, DO, Turbidity	VOA	**Primary Constituents:** benzene, chlorobenzene, cis-1,2-dichloroethene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, dichlorodifluoromethane, 1,1-dichloroethene, trichlorofluoromethane, vinyl chloride	(See Figure 9) **SEMIANNUAL EVALUATIONS:** **Corrective Action Monitoring Performance Criteria for Primary Constituents** Concentrations of Primary Constituents in each well will be compared to the approved reporting limits specified in Appendix B of the SAP. -Performance criteria have been met if measured concentrations of all constituents in all wells are less than their respective reporting limit. -Performance criteria are not being met if the measured concentration of a constituent in any well is equal to or greater than the respective reporting limit. Resample the well for the Primary Constituent in question, as soon as practicable but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in quadruplicate. **Confirmation that Performance Criteria are not being met:** It is confirmed that the performance criteria are not being met if atleast two of the four confirmation sample results are above the performance criterion. **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate).
6176	Well						
6177	Well						
4355	Well						
9317	Well						
Northeast Perimeter Groundwater Compliance Monitoring							
4358	Well	Semiannual (2nd and 4th Quarters)	Yes	pH, Conductivity, Temperature, ORP, DO, Turbidity	VOA	**Primary Constituents:** benzene, chlorobenzene, cis-1,2-dichloroethene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, dichlorodifluoromethane, 1,1-dichloroethene, trichlorofluoromethane, vinyl chloride	(See Figure 9) **SEMIANNUAL EVALUATIONS:** Provide a trend chart for Primary Constituents that have previously been detected. **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate). Results are evaluated to confirm that detected concentrations of primary constituents are stable or decreasing over time.
3540A	Well						

Table 2-I. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Northeast Perimeter Corrective Action Natural Attenuation Monitoring								
	(MW-A)	Well	Semiannual (2nd and 4th Quarters)	Yes	pH, Conductivity, Temperature, ORP, DO, Turbidity	VOA, N/NO3, CHLORIDE, SULFATE, DISSOLVED METALS (filtered), SULFIDE, AMMONIA/ TOTAL PHOSPHORUS, TOC, ETHANE, ETHENE, CARBON DIOXIDE	**Primary Constituents:** 1,1,1-trichloroethane, 1,1-dichloroethane, dichlorodifluoromethane, trichlorofluoromethane, chlorobenzene, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, vinyl chloride **Natural Attenuation Parameters:** manganese, sodium, zinc, ammonia, carbon dioxide, chloride, ethane, ethene, ferrous iron, nitrate, nitrite, phosphorus, sulfate, sulfides, total organic carbon	(See Figure 9) **SEMI-ANNUAL EVALUATION:** **<u>Corrective Action Chemical Monitoring Evaluation:</u>** Concentrations will be evaluated for evidence of on-going natural attenuation. - If results indicate natural attenuation is not sufficient, Dow will evaluate if additional corrective actions are needed. **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate).
	(MW-B)	Well						
	(MW-C)	Well						
	(MW-D)	Well						
	(MW-F)	Well						
	(MW-G)	Well						
	(MW-I)	Well						
	(MW-J)	Well						
	(MW-K)	Well						
	(MW-1)	Well						
	(MW-2)	Well						
	(MW-2B)	Well						
	(MW-3)	Well						
	(MW-3B)	Well						
	(MW-4)	Well						
	(MW-4B)	Well						
	(MW-5)	Well						
	(MW-6)	Well						
	(MW-7)	Well						
	(MW-8)	Well						
	(MW-9)	Well						

Table 2-I. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
	Plume Sentinel Monitoring							
	MW-H	Well	Semiannual (2nd and 4th Quarters)	Yes	Same as above	Same as above	Same as above	**SEMI-ANNUAL EVALUATION:** **Plume Sentinel Well Performance Criteria:** Concentrations of Primary Constituents in each well sampled during the quarter will be compared to their performance criteria values, specified in Appendix J of the SAP. - Performance criteria are being met if measured concentrations of all primary constituents are equal to or less than their respective performance criteria values. -Performance criteria are not being met if the measured concentration of a primary constituent in any well is greater than the respective performance criteria value. Resample the well for the constituent in question, as soon as practicable. The well will be resampled 4 times, repurging between each sampling. **Confirmation that Performance Criteria are not met:** It is confirmed that performance criteria are not met if 2 or more of the 4 replicates are detected above the performance criteria value, or at least 1 of the 4 replicates is detected at 5x the performance criteria value. **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate).
	(MW-10)	Well						

Table 2-I. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Northeast Perimeter Groundwater Monitoring								
	6175	Well	Semiannual (2nd and 4th Quarters)	Yes	pH, Conductivity, Temperature, ORP, DO, Turbidity	VOA, N/NO3, CHLORIDE, SULFATE, METALS (not filtered), SULFIDE, AMMONIA/TOTAL PHOSPHORUS, TOC, ETHANE, ETHENE, CARBON DIOXIDE	benzene, chlorobenzene, cis-1,2-dichloroethene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, dichlorodifluoromethane, 1,1-dichloroethene, trichlorofluoromethane, vinyl chloride 1,1,1-trichloroethane, 1,1-dichloroethane, chlorobenzene, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, vinyl chloride, manganese, sodium, zinc, ammonia, carbon dioxide, chloride, ethane, ethene, ferrous iron, nitrate, nitrite, phosphorus, sulfate, sulfides, total organic carbon	(See Figure 9) **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate).
	6178	Well						

Table 2-J. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
West Plant Perimeter Along Poseyville Road Detection Monitoring								
	4581	Well	Quarterly (SWL only)/ Annual (Analysis)	Yes	Temp, pH, Conductivity, ORP, DO, Turbidity	VOA	Primary Constituents: Carbon tetrachloride, Chloroform	(See Figure 10) **ANNUAL EVALUATION:** **Compliance Monitoring Performance Criteria:** Concentrations of primary constituents in each well sampled during that quarter will be compared to their performance criteria values, specified in Appendix J of the SAP. -Performance criteria are being met if the measured concentrations are less than or equal to the respective performance criteria value. -Performance criteria are not being met if the measured concentration of a constituent in any well is greater than the respective performance criteria value. As soon as practicable, re-sample of the affected well for the constituent in question but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in quadruplicate. **Confirmation that Performance Criteria are not being met:** It is confirmed that the performance criteria are not being met if atleast two of the four confirmation sample results are above the performance criterion. **QUARTERLY EVALUATION:** Hydraulic Evaluation is conducted as part of the Facility Shallow Groundwater Hydraulic Monitoring Program.
	4585	Well						
	6278	Well						
	6280	Well						
	6518	Well						
	6520	Well						
	6545	Well						
	6546	Well						
	6552	Well						

Table 2-K. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Facility Shallow Groundwater - Hydraulic Monitoring							
3081	Piezo[5]	Semi-annually	Yes	None	None	None	(See Figure 11) **SEMI_ANNUAL-EVALUATION:** **Hydraulic Performance Criteria** Develop contour maps of the water elevations to assess groundwater flow conditions. Evaluate the hydraulic data semi-annually to determine if there are any areas of potential off-site groundwater migration. -Performance criteria are being met hydraulic data show no potential for off-site groundwater migration, unless those areas are currently being chemically monitored under Section IX of the Operating License. -Performance criteria are not being met if potential for groundwater flow beyond the facility boundary is identified. **ANNUAL EVALUATION:** Summarize the year's data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph).
3082	Piezo						
3083	Piezo[5]						
3538A	Piezo						
3538B	Piezo						
3539A	Piezo						
3539B	Piezo						
3540A	Well[1]						
3540B	Piezo						
3541C	Piezo						
3542A	Piezo						
3543A	Piezo						
3557	Piezo						
3558	Piezo						
3653	Piezo						
3654	Piezo						
3655	Piezo						
3656	Piezo						
3657	Piezo						
3658	Piezo						
3661	Piezo						
3666	Piezo						

[1] indicates well/piezo that is chemically monitored under the NEP program

[2] indicates well/piezo that is also included in the GTRA and RGIS West hydraulic monitoring programs

[3] indicates well/piezo that is also included in a PLF monitoring program

[4] indicates piezo that is also included in the 7th Street Purge Wells Area monitoring program

[5] indicates well/piezo that is chemically monitored under the RGIS East program

[6] indicates well/piezo that is also included in the LEL III hydraulic monitoring program

Table 2-K. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Facility Shallow Groundwater - Hydraulic Monitoring (continued)								
	3668	Piezo	Semi-annually	Yes	None	None	None	(same as evaluation on page 1)
	3669	Piezo						
	3670	Piezo						
	3671	Piezo						
	3673	Piezo						
	3675	Piezo						
	5040A	Piezo						
	5040B	Piezo						
	5040C	Piezo						
	5040D	Piezo						
	2931	Piezo						
	2931A	Piezo						
	3549A	Piezo[4]						
	3706	Piezo						
	3706A	Piezo[4]						
	4175	Piezo						
	4175A	Piezo[4]						
	4176	Piezo						
	4179A	Piezo[4]						
	4180	Piezo						
	4181	Piezo						
	4182	Piezo						

see page 1 for footnote definitions

Table 2-K. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Facility Shallow Groundwater - Hydraulic Monitoring (continued)								
	4183	Piezo	Semi-annually	Yes	None	None	None	(same as evaluation on page 1)
	4184	Piezo						
	5220	Piezo[2]						
	5232	Piezo[2]						
	5266	Piezo[2]						
	2790	Piezo						
	2964	Piezo						
	3297	Piezo						
	3299	Piezo						
	3331	Piezo						
	9059	Piezo						
	3339	Piezo						
	3355	Piezo						
	3356	Piezo						
	3360	Piezo						
	3361	Piezo						
	3362	Piezo						
	3366	Piezo[6]						
	3368	Piezo						
	3370	Piezo						
	3391	Piezo						
	3392	Piezo						

see page 1 for footnote definitions

Table 2-K. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Facility Shallow Groundwater - Hydraulic Monitoring (continued)								
	3544A1	Piezo	Semi-annually	Yes	None	None	None	(same as evaluation on page 1)
	3544B1	Piezo						
	3544C1	Piezo						
	3587	Piezo[6]						
	3592	Piezo						
	3674	Piezo						
	3676	Piezo						
	3682	Piezo						
	4293	Piezo[5]						
	6532	Piezo[5]						
	6533	Piezo[5]						
	6534	Piezo[5]						
	6535	Piezo[5]						
	5137	Piezo						
	5981	Piezo[5]						
	5985	Piezo[5]						
	5990	Piezo[5]						
	9012	Piezo[5]						
	2927A	CD-3 Area Piezo						
	2925	CD-3 Area Piezo						
	3285	Piezo						
	5386	Piezo						
	5385	Well[1]						
	5384	Piezo						
	5383	Piezo						
	5387	Piezo						
	5434	Piezo						
	5433	Piezo						
	5432	Piezo						
	5435	Piezo						

see page 1 for footnote definitions

Table 2-K. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Facility Shallow Groundwater - Hydraulic Monitoring (continued)							
6175	Well[1]	Semi-annually	Yes	None	None	None	(same as evaluation on page 1)
6176	Well[1]						
6177	Well[1]						
6178	Well[1]						
4355	Well[1]						
4358	Well[1]						
4359	Piezo						
3539C	Piezo						
3660	Piezo						
9317	Well[1]						
3543C1	Piezo						
3543B1	Piezo						
4348	Piezo						
5388	Piezo						
5630	Piezo						
5793	Piezo						
5794	Piezo						
5795	Piezo						

Table 2-K. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Facility Shallow - Hydraulic Monitoring (Continued)								
	2790A	Piezo (Top of Riverbank)						
	2962	Piezo (Top of Riverbank)						
	2963	Piezo (Top of Riverbank)						
	2965	Piezo (Top of Riverbank)						
	3664	Piezo (Top of Riverbank)						

[1] indicates well/piezo that is chemically monitored under the NEP program

Table 2-K. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Facility Shallow Groundwater Monitoring								
	2929A	Piezo[3]	Semi-annually	Yes	None	None	None	(same as evaluation on page 1)
	2930	Piezo						
	2930A	Piezo[3]						
	3278	Piezo[3]						
	3870	Piezo						
	4573	Piezo						
	4574A	Piezo						
	4574B	Piezo						
	4575	Piezo						
	4576	Piezo						
	4577	Piezo						
	4578	Piezo						
	4579A	Piezo						
	4580	Piezo						
	4584	Piezo						
	6277	Piezo						
	6279	Piezo						
	6281	Piezo						
	6282	Piezo						

see page 1 for footnote definitions

Table 2-K. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Facility Shallow Groundwater Monitoring							
6519	Piezo	Semi-annually	Yes	None	None	None	
6544	Piezo						
6550	Piezo						
6551	Piezo						
6553	Piezo						
6547A	Piezo						
6547B	Piezo						
6548	Piezo						
6549	Piezo						
4581	Well						
4585[1]	Piezo						
6278[1]	Well						
6280[1]	Well						
6518[1]	Well						
4582[1]	Well						
6520[1]	Well						
6545[1]	Well						
6546[1]	Well						
6552[1]	Well						

Table 2-L. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
South Saginaw Road Tile Performance Monitoring								
	SA	Piezo	Quarterly	Yes	Not Required	None	None	(See Figure 12) **QUARTERLY EVALUATIONS:** **Hydraulic Monitoring Performance Criteria:** Water elevations will be compared to the tile invert at each piezometer location to determine if water is building up in the tile system. -Performance criteria are being met if the static water levels in the piezometers are less than 12" above the corresponding tile invert, indicating drawdown to the tile. -Performance criteria are not being met if the static water levels in the piezometers are greater than or equal to 12" above the corresponding tile invert, indicating that water is building up in the tile system. If high water levels in either the piezometers or the manholes are determined to be accurate and representative of conditions, the frequency of maintenance will be evaluated. Jetting or other maintenance will be completed to restore performance of tile system. **ANNUAL EVALUATION:** Performance Summary: The licensee shall submit a summary of maintenance activities from the previous year and a performance evaluation of the SSRT, including trend evaluation(s) of water quality over time, monthly flow and volumes of water removed as well as long-term trend evaluations of water levels from the SSRT piezometers.
	SB	Piezo						
	SC	Piezo						
	SD	Piezo						
	SE	Piezo						
	SF	RGIS Extension Piezo						
	SG	RGIS Extension Piezo						
	LS-S9	Sump	Monthly	No				Monthly total and average flows will be tracked over time to assess performance
South Saginaw Road Tile Performance Monitoring								
	LS-S9	Sump	Annually	No	Not Required	To be determined	**Primary Constituents:** To be determined	**(See Figure 1)** **Chemical Evaluation:** Every five years (beginning in 2019) sample lift station S9 for 40 CFR 264 Appendix IX list. Re-evaluate groundwater monitoring Primary Constituents by comparing with results of 40 CFR 264 Appendix IX testing.

Table 2-M. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Sludge Dewatering Facility (SDF) Groundwater Detection Monitoring								
	4506	Detection Monitoring Well	Quarterly	Yes	Temp, pH, Conductivity, ORP, DO, Turbidity	VOA	**Primary Constituents**: benzene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene,	(See Figure 13) **QUARTERLY EVALUATIONS:** **Detection Monitoring Performance Criteria for Primary Constituents** Concentrations of Primary Constituents in each well will be compared to the reporting limits specified in Appendix B of the SAP. -Performance criteria have been met if measured concentrations of all constituents in all wells are less than their respective reporting limit. -If the measured concentration of a constituent in any well is equal to or greater than the respective reporting limit, performance criteria have not been met: resample the well for the Primary Constituent in question, as soon as practicable but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in duplicate. **Confirmation that Performance Criteria are not being met:** It is confirmed that the performance criteria are not being met if atleast one of the two confirmation sample results are above the performance criterion. **Hydraulic Monitoring Performance Criteria** Water elevations will be evaluated to ensure an inward gradient using hydrographs. -Performance criteria are being met if hydraulic data indicate an inward gradient. -Performance criteria are not being met if hydraulic data indicate a lack of inward gradient at all paired wells. Initiate perimeter chemical monitoring. **ANNUAL EVALUATIONS:** -A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate). -Summarize the year's hydraulic data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph). **TARGET LIST EVALUATION:** Target list will be reevaluated and adjusted based on results of the LS-50 Appendix IX sampling every 5 years, beginning in 2010.
	4507	Detection Monitoring Well						

Table 2-M. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Sludge Dewatering Facility (SDF) Groundwater Detection Monitoring							
3775	Perimeter Well	Quarterly (SWL only)/ Chemical Analysis (as described in Data Evaluation)	Yes	None	VOA, DISSOLVED METALS (filtered), SULFATE, CHLORIDE, CARBS	Primary Constituents: benzene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, Tracking Parameters: sodium, potassium, iron, magnesium, calcium, chloride, bicarbonate alkalinity (HCO3), carbonate alkalinity(CO3), sulfate (SO4)	**QUARTERLY EVALUATIONS:** **Hydraulic Monitoring Performance Criteria** Water elevations will be evaluated to ensure an inward gradient using hydrographs. -Performance criteria are being met if hydraulic data indicate an inward gradient. -Performance criteria are not being met if hydraulic data indicate a lack of inward gradient along the perimeter of the SDF. Initiate chemical monitoring of perimeter wells (described below). **ANNUAL EVALUATIONS:** Summarize the year's hydraulic data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph). **4-YEAR EVALUATIONS:** **Chemical Monitoring of Perimeter Wells** Perimeter Wells will be sampled and chemically analyzed every 4 years, or in response to a lack of inward hydraulic gradient (described above). Summarize groundwater Primary Constituent and Tracking Parameter results, including Tracking Parameter trends. **Determine Statistically Significant Increase for a Tracking Parameter** Temporal Stiff diagrams will evaluate relative percent difference for each of the compounds on the chart from previous monitoring period to current. Statistically significant increases will be recognized by at least three consecutive temporal plots showing the same sequential pattern, or a long term change in concentration that is defined by a consistent 50% or more increase average concentration over a period of four monitoring events for any individual Tracking Parameter. Note: for temporal Stiff diagram evaluations, non-detect values will be considered at the reporting limit. See Appendix H for description of using Stiff diagrams for chemical evaluation. **Statistically Significant Increase Confirmation for Tracking Parameter** The Tracking Parameter is confirmed if -confirmation sampling results indicate the same temporal stiff plot sequential pattern or result in a 50% or more increase per year in average concentration over time over a period of four monitoring events.
3776	Perimeter Well						
3777	Perimeter Well						
3778	Perimeter Well						
3779	Perimeter Well						
5487	Perimeter Well						
3916	Perimeter Well						
3922	Perimeter Well						
6143	Internal Cell Piezo	Quarterly (SWL only)		None	None	None	
6144	Internal Cell Piezo						
6145	Internal Cell Piezo						
6146	Internal Cell Piezo						
6147	Internal Cell Piezo						
6148	Internal Cell Piezo						
6149	Internal Cell Piezo						
4506A	Internal Cell Piezo						
LS-50	Lift Station	Once Every Five Years	No	None	VOA, EOA, METALS (not filtered), PESTICIDE/PCB, CYAN, D/F, SULFIDE	40 CFR, Part 264, Appendix IX list; with 2,3,7,8-substituted dioxins and furans (17 isomers) and 2,3,7,8-TCDD TEQ using WHO-TEF, rather than congener group totals	**Chemical Evaluation:** Every five years (beginning in 2006, continued in 2010) sample lift station 50 for 40 CFR 264 Appendix IX list. Re-evaluate groundwater monitoring Primary Constituents by comparing with results of 40 CFR 264 Appendix IX testing. **Leachate Volumes:** Quantities of leachate pumped will be recorded, tabulated by month and year, and compared graphically to quantities generated during the reported year and previous years. If there is an increase in leachate quantities, the source shall be indicated in the annual report.

Table 2-N. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Poseyville Landfill Groundwater Leak Detection Chemical Monitoring								
	2692	Monitoring Well (flowing)	Annually	Yes	Temp, pH, Conductivity, ORP, DO, Turbidity	VOA	**<u>Primary Constituents</u>:** benzene, chlorobenzene, chloroform, ethylbenzene	(See Figure 14) **QUARTERLY EVALUATIONS:** **<u>Compliance Monitoring Performance Criteria</u>** Concentrations of constituents in each well sampled during that quarter will be compared to their performance criteria values, specified in Appendix J of the SAP. -Performance criteria are being met if the measured concentrations are less than the respective performance criteria value. -Performance criteria are not being met if the measured concentration of a constituent in any well is equal to or greater than the respective performance criteria value. As soon as practicable, re-sample of the affected well for the constituent in question but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in duplicate. **Confirmation that Performance Criteria are not being met:** It is confirmed that the performance criteria are not being met if atleast one of the two confirmation sample results are above the performance criterion. **ANNUAL EVALUATIONS:** - Use SWL data to develop hydraulic cross sections around the landfill perimeter - Use SWL data to develop hydrographs - Evaluate changes in vertical hydraulic gradient
	2693	Monitoring Well (flowing)						
	2969	Monitoring Well						
	2985	Monitoring Well (flowing)						
	2991	Monitoring Well (flowing)						
	2992	Monitoring Well (flowing)						
	2994	Monitoring Well (flowing)						
	3004	Monitoring Well (flowing)						
	2688	Piezo / Well	Quarterly					
	2691	Piezo / Well						
	2438	Monitoring Well (flowing)	Semi-annually					
	2684	Monitoring Well						
	2686	Monitoring Well						
	2968	Monitoring Well						
	2986	Monitoring Well						
	2995	Monitoring Well						
	2996	Monitoring Well						
	2998	Monitoring Well						
	2999	Monitoring Well						
	4505	Monitoring Well						

Table 2-N. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Poseyville Landfill Corrective Action Hydraulic Monitoring								
	PW-2690A	Purge Well	Quarterly	Yes	Not Required	None	None	(See Figure 14) **QUARTERLY EVALUATIONS:** **<u>Corrective Action Hydraulic Monitoring Program Performance Criteria</u>** Static water level data will be converted to U.S.G.S. datum elevations and a contour of the potentiometric surface elevation will be produced. The contour map will be evaluated to determine if contaminated groundwater at the site is being contained by the purge wells. -Performance criteria are being met if the evaluation of the groundwater elevations indicates that contaminated groundwater at the site is being contained by the purge wells. -Performance criteria are not being met if hydraulic data indicate a potential that contaminated groundwater is not being contained by the purge wells. **ANNUAL EVALUATIONS:** - Use SWL data to develop hydrographs - Evaluate hydrographs for changes in horizontal gradient
	PW-2917	Purge Well						
	PW-2960	Purge Well						
	PW-2961	Purge Well						
	2549	Piezo						
	2550	Piezo						
	2688	Piezo / Well						
	2907	Piezo / Well						
	6174	Piezo / Well						
	2691	Piezo / Well						
	2902	Piezo						
	2903	Piezo						
	2904	Piezo						
	2906	Piezo						
	2908	Piezo						
	2915	Piezo						
	2917A	Piezo						
	2922	Piezo						
	2929A	Piezo[1]						
	2930	Piezo[1]						
	3278	Piezo[1]						
	3280	Piezo						
	3282	Piezo						
	3283	Piezo						
	5923	Piezo						
	5924	Piezo						
	5925	Piezo						

[1] indicates piezo is also included in Facility Shallow Hydraulic Monitoring Program
[2] indicates piezo is also included in the PLF Corrective Action Chemical Monitoring Program
[3] indicates well is included in both the PLF Corrective Action Chemical Monitoring Program and Hydraulic Monitoring Program

Table 2-N. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Poseyville Landfill Corrective Action Chemical Monitoring							
3283	Piezo / Well	Quarterly	Yes	Temp, pH, Conductivity, ORP, DO, Turbidity	VOA	**<u>Primary Constituents</u>:** benzene, chlorobenzene, chloroform, ethylbenzene	(See Figure 14) **QUARTERLY EVALUATIONS:** **<u>Corrective Action Chemical Monitoring Program Performance Criteria</u>:** Develop background in accordance with Condition IX.B.3.(b) of this license. Performance Criteria will be submitted to DEQ for review and approval. **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate).
2907	Piezo / Well						
2902	Piezo / Well						
5925	Piezo / Well						
6174	Piezo / Well						
2691	Piezo / Well						
2688	Piezo / Well						
PW-2690A	Purge Well	Quarterly	Yes	Temp, pH, Conductivity, ORP, DO, Turbidity	VOA	**<u>Primary Constituents</u>:** benzene, chlorobenzene, chloroform, ethylbenzene	(see Figure 14) **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate).
PW-2917	Purge Well						
PW-2960	Purge Well						
PW-2961	Purge Well						

Table 2-O. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
LEL I Hydraulic Monitoring Program								
	8415	Well	Quarterly	Yes	None	None	None	(See Figure 15) QUARTERLY EVALUATIONS: Slurry Wall Monitoring Performance Criteria Evaluation of LEL I slurry wall integrity will be made by a review of hydrographs. -Performance criteria are being met if hydrograph analysis indicate the slurry wall is successfully isolating the interior area of the slurry wall from the exterior. -If performance criteria are not being met, then further corrective measures will be proposed. A work plan will be submitted to the EGLE for the implementation of additional corrective action as appropriate should monitoring suggest a deficiency with the slurry wall. ANNUAL EVALUATION: Summarize the year's data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph).
	8414	Well						
	8412	Well						
	8413A	Well						
	8413B	Well						

Table 2-P. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
LEL II Hydraulic Monitoring Program								
	3590	Well	Quarterly	Yes	None	None	None	(See Figure 16) QUARTERLY EVALUATIONS: Slurry Wall Monitoring Performance Criteria Evaluation of LEL II slurry wall integrity will be made by a review of hydrographs. -Performance criteria are being met if hydrograph analysis indicate the slurry wall is successfully isolating the interior area of the slurry wall from the exterior. -If performance criteria are not being met, then further corrective measures will be proposed. A work plan will be submitted to the EGLE for the implementation of additional corrective action as appropriate should monitoring suggest a deficiency with the slurry wall. ANNUAL EVALUATION: Summarize the year's data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph).
	3368	Well						
	3369	Well						
	3370	Well						
	3371	Well						
	3358	Well						
	3359	Well						
	3588	Well						
	3360	Well						
	3600	Well						
	3361	Well						
	3362	Well						
	3363	Well						

Table 2-Q. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
LEL III Hydraulic Monitoring Program								
		Well	Quarterly	Yes	None	None	None	**(See Figure 16)** **QUARTERLY EVALUATIONS:** Slurry Wall Monitoring Performance Criteria Evaluation of LEL III slurry wall integrity will be made by a review of hydrographs. -Performance criteria are being met if hydrograph analysis indicate the slurry wall is successfully isolating the interior area of the slurry wall from the exterior. -If performance criteria are not being met, then further corrective measures will be proposed. A work plan will be submitted to the EGLE for the implementation of additional corrective action as appropriate should monitoring suggest a deficiency with the slurry wall. ANNUAL EVALUATION: Summarize the year's data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph).
	3592	Well						
	8335	Well						
	8336	Well						
	8337	Well						
		Well						
	8339	Well						
	8340	Well						
	8343	Well						
	8344	Well						
	8345	Well						
	8346	Well						
	3367	Well						
	3366	Well[1]						
	3587	Well[1]						
	3365	Well						
	3364	Well						

Table 2-R. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
1925 Landfill Hydraulic Monitoring Program								
	MW-1	Well	Quarterly basis and monthly May thru August	Yes	None	None	None	(See Figure 17) **QUARTERLY EVALUATION:** **<u>Hydraulic Monitoring Performance Criteria</u>** Evaluation of 1925 Landfill will be made by a review of hydrographs. -Performance criteria are being met if hydraulic evaluations indicate that the potentiometric surface within the landfill is not increasing and remain below ground level. -Performance criteria are not being met if hydraulic evaluations suggest that the potentiometric surface within the landfill is consistently increasing or remaining above ground level. If performance criteria are not being met, a cap inspection shall be confirmed to verify seepage is not occurring. Further corrective measures will be proposed as required by Condition IX.B.3.(d). **ANNUAL EVALUATION:** Summarize the year's data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph).
	MW-3s	Well						
	MW-3d	Well						
	MW-3i	Well						
	PZ-1s	Well						
	PZ-1d	Well						
	PZ-2	Well						
	PZ-6 (new)	Well						
	PZ-9i	Well						
	PZ-10i	Well						
	PZ-12s	Well						
	PZ-12i	Well						
	PZ-12d	Well						
	PZ-13s	Well						
	PZ-13i	Well						
	PZ-14i	Well						
	PZ-14d	Well						

Table 2-S. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Tertiary Pond Recovery Monitoring								
	3795	Well[1]	Semiannually	Yes	Temp, pH, Conductivity, ORP, DO, Turbidity	VOA	**Primary Constituents:** benzene, chlorobenzene,	(See Figures 1 & 18) **SEMI-ANNUAL EVALUATION:** **Compliance Monitoring Performance Criteria** Concentrations of constituents in each well sampled during that quarter will be compared to their performance criteria values, specified in Appendix J of the SAP. -Performance criteria are being met if the measured concentrations are less than or equal to the respective performance criteria value. -Performance criteria are not being met if the measured concentration of a constituent in any well is or greater than the respective performance criteria value. As soon as practicable, re-sample of the affected well for the constituent in question but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in quadruplicate. Confirmation that Performance Criteria are not being met: It is confirmed that the performance criteria are not being met if atleast two of the four confirmation sample results are above the performance criterion. **ANNUAL EVALUATIONS:** A summary of groundwater quality data results, including a narrative summary of results and trends, data graphs, and isochems (if appropriate).
Tertiary Pond Slurry Wall Hydraulic Monitoring								
	3795	Well[1]	Quarterly	Yes	None	None	None	See Figure 2 **QUARTERLY EVALUATION:** **Hydraulic Monitoring Performance Criteria** Evaluation of the T-Pond slurry wall integrity will be made by a review of hydrographs, as described below: Compare 3795 SWL to Piezo 4300 SWL (3795 should be lower) Compare 4163 SWL to Piezo 4164 SWL (4163 should be lower) Compare 4157 SWL to Piezo 4158 SWL (4157 should be lower) Compare 4152 SWL to Piezo 4299 SWL (4299 should be lower) -Performance criteria are being met if the hydrograph analysis indicate that the groundwater elevation on the interior of the slurry wall is significantly higher than the water elevation on the exterior of the slurry wall. -Performance criteria are not being met if a significant differential head across the slurry wall is not present, and shall result in further investigation on a schedule approved by EGLE. **ANNUAL EVALUATION:** Summarize the year's data, any anomalous readings, and develop diagrams of representative horizontal and vertical flow components (hydrograph).
	4300	Piezo						
	4163	Piezo						
	4164	Piezo						
	4157	Piezo						
	4158	Piezo						
	4299	Piezo						
	4152	Piezo						

[1] 3795 is also included in the GTRA hydraulic monitoring program

Table 2-T. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Overlook Park Hydraulic Monitoring Program								
	CO-A Inboard CO-A Outboard	Overlook Park Collection Tile	Monthly	Yes	None	None	None	**(See Figure 19)** **MONTHLY EVALUATIONS:** **<u>Hydraulic Evaluation</u>** Manually collected static water level in inboard piezometer shall be compared to the manual static water level in the corresponding outboard piezometer. **<u>Performance Criteria</u>** -Performance criteria are being met if the manual static water level in the inboard piezometer is below the manual static water level in the corresponding outboard piezometer, or if the outboard piezometer is in a "dry" condition. -Performance criteria are not being met if the manual static water levels in the inboard piezometer is greater than the manual static water level in the corresponding outboard piezometer. **QUARTERLY EVALUATIONS:** Summarize manually collected hydraulic data in a table, including piezometer identification, identification of primary piezometers, date of data collection, USGS water elevation for each piezometer.
	CO-B Inboard CO-B Primary CO-B Outboard	Overlook Park Collection Tile	Monthly	Yes	None	None	None	**(See Figure 19)** **MONTHLY EVALUATIONS:** **<u>Hydraulic Evaluation</u>** Manually collected static water levels in primary piezometers shall be compared to the manual static water levels in the corresponding outboard piezometers. **<u>Performance Criteria</u>** -Performance criteria are being met if the manual static water levels in the primary piezometers are below the manual static water levels in the corresponding outboard piezometers (drawdown to primary), or if the outboard piezometer is in a "dry" condition. -Performance criteria are not being met if the manual static water levels in the primary piezometers are equal to or greater than the manual static water levels in the corresponding outboard piezometers. **QUARTERLY EVALUATIONS:** Summarize manually collected hydraulic data in a table, including piezometer identification, identification of primary piezometers, date of data collection, USGS water elevation for each piezometer.
Overlook Park Groundwater Monitoring Program								
	6159	Piezometer	Semi-Annually	Yes	None	None	None	**<u>Hydraulic Evaluation</u>** Static water level data will be converted to U.S.G.S. datum elevations and a contour of the potentiometric surface elevation will be produced to verify the appropriateness of the sentinel well. (See Figure 1) ANNUAL EVALUATIONS: Provide a narrative summary of groundwater elevation data and includes any changes or anomalies in the annual report.
	6160	Piezometer						
	6161	Piezometer						
	6158A	Piezometer						
	6158B	Piezometer						
	6158C	Piezometer						
	2805	Piezometer						
	6162	Piezometer						
	8702	Piezometer						
	8703	Piezometer						

Table 2-U. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
US-10 Tank Farm Monitoring Program								
	US-10 TF	Sump	Annually	No	None	VOA	styrene	**ANNUAL EVALUATION:** Trend charts will be used to evaluate styrene concentration over time. Results are evaluated to verify that detected concentrations of specific constituents are stable or decreasing over time.

Table 2-V. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Soil Box Monitoring							
19 Gate	Soil Box	Semiannual (unless otherwise directed by the revised Soil Box Evaluation Plan)	No	None	D/F (Report on dry weight basis)	2,3,7,8-substituted dioxins and furans (17 isomers) and 2,3,7,8-TCDD TEQ, using WHO-TEF.	(See Figure 20) Results will be evaluated according to the Soil Box Data Evaluation Plan included as Appendix I to the SAP.
1791 Gate							
608 Gate							
52 Gate							
SR-A (Removed during construction. To be rebuilt in nearby location once construction is complete.)							
SR-B							
NEP-A							
NEP-B							
NEP-C							
SLF-01							
SLF-02							
SLF-04							

Table 2-W. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Ambient Air Monitoring Program							
Midland Plant							
AQS # 261110960	Site 1E	Every Six Days for Organic Analyte Every Twelve Days for TSP	No	Mean Horizontal Wind Velocity, Mean Wind Direction, Temperature, Wind Stability Class, and Relative Humidity (made available upon request)	Organic Analytes and Total Suspended Particulates (TSP)	1,1,1,2-Tetrachloroethane 1,1,2-Trichloroethane 1,2-Dichloroethane Acetonitrile 1,1,2,2-Tertrachloroethane 1,4-dichlorobenzene Styrene Benzene Chloroform Trichloroethylene Total Suspended Particulates (TSP)	(See Figure 21) Ambient Air Performance Criteria Concentrations of constituents at each station sampled during that quarter will be compared to their performance criteria values, specified in Appendix J of the SAP. -Performance criteria are being met if the measured concentrations are less or equal to the respective performance criteria value. -Performance criteria are not being met if the measured concentration of a constituent in any station is or greater than the respective performance criteria value. As soon as possible, but no later than three business days, notify the Office, Hazardous Waste Section by email. Notification will include the analytical results, and a proposal for follow-up monitoring and/or corrective actions, if appropriate. The follow-up actions would address activities that may be occurring at the site with might impact the results of the monitoring (e.g., plant upsets, events not associated with Dow operations, analytical quality exceptions). Dow will provide the results of actions taken, if any, for this event in the Annual Quality Assurance Report (listed below). EVALUATIONS: All sample analyses, field data and quality control data will be reviewed on a quarterly basis. Ambient air monitoring results will be provided to the Michigan Environmental Great Lakes adn Energy (EGLE) Waste Management and Radiological Protection Division (WMRPD), in accordance with Condition XII.I.3, and within each Annual Environmental Monitoring Report, described in Section 2.1 of this SAP. Hourly meteorological measurements will be maintained on file by Dow and made available for inspection upon request.
AQS # 261110961	Site 1W						
AQS # 261110953	Site 3						
AQS # 261110959	Site 4A						
AQS # 261110955	Site 5A						
Salzburg Landfill							
AQS # 26111914	Waldo Rd Gate	Every Six Days - according to NAAQS calendar	No	Mean Horizontal Wind Velocity, Mean Wind Direction, Temperature, Wind Stability Class, and Relative Humidity (made available upon request)	Total Suspended Particulates (TSP)	Total Suspended Particulates (TSP)	(See Figure 21) **<u>Ambient Air Performance Criteria</u>** Concentrations of constituents at each station sampled during that quarter will be compared to their performance criteria values, specified in Appendix J of the SAP. -Performance criteria are being met if the measured concentrations are less or equal to the respective performance criteria value. -Performance criteria are not being met if the measured concentration of a constituent in any station is or greater than the respective performance criteria value. As soon as possible, but no later than three business days, notify the Office, Hazardous Waste Section by email. Notification will include the analytical results, and a proposal for follow-up monitoring and/or corrective actions, if appropriate. The follow-up actions would address activities that may be occurring at the site with might impact the results of the monitoring (e.g., plant upsets, events not associated with Dow operations, analytical quality exceptions). Dow will provide the results of actions taken, if any, for this event in the Annual Quality Assurance Report (listed below). **EVALUATIONS:** All sample analyses, field data and quality control data will be reviewed on a quarterly basis. Ambient air monitoring results will be provided to the Michigan Environmental Great Lakes adn Energy (EGLE) Waste Management and Radiological Protection Division (WMRPD), in accordance with Condition XII.I.3, and within each Annual Environmental Monitoring Report, described in Section 2.1 of this SAP. Hourly meteorological measurements will be maintained on file by Dow and made available for inspection upon request.
AQS # 26111917	Downwind of Active Cell						
AQS # 26111918	South						

Table 2-X. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Salzburg Landfill Leachate Monitoring							
Cell 1 - 5	Closed Hazardous Waste Cells/ Lift Station 2A	Chemical Monitoring: Active Cells - annually (dependent upon flow); Closed Cells - every 5 years beginning in 2010.	No	pH, Temp, Cond	VOA, EOA, TOC, DISSOLVED METALS (filtered), ANIONS, dioxins and furans	40 CFR, Part 264, Appendix IX list; with 2,3,7,8-substituted dioxins and furans (17 isomers) and 2,3,7,8-TCDD TEQ using WHO-TEF, rather than congener group totals	**Leachate Chemical Monitoring** Data will be used for the purposes of evaluating Primary Chemical Constituent List for the Salzburg Landfill Glacial Till Monitoring, Leak Detection System Monitoring and Surface Water Monitoring programs. This evaluation is included in the annual report. If new constituents are found in the leachate they will be evaluated based on frequency of detection, the concentrations detected, the risk to human health, and the mobility of the constituent.
Cell 6 - 8	Closed Hazardous Waste Cells/ Lift Station 5						
Cell 9 - 10	Closed Hazardous Waste Cells/Lift Station 7						
Cell 11-12	Closed Hazardous Waste Cells/Lift Station 9						
Cell 13-14	Closed Hazardous Waste Cells/Lift Station 13						
Cell 15-16	Closed Hazardous Waste Cells/Lift Station 19						
Cell 17-19	Closed Hazardous Waste Cells/Lift Station 23						
Cell 20-22	Closed Hazardous Waste Cells/ Lift Station 25						
Cell 23-26	Active Hazardous Waste Cells/ Lift Station 27						
Cell 38-39	Closed Non-Hazardous Cells/ Lift Station 38						
Cell 40-43	Closed Non-Hazardous Cells/ Lift Station 22						

Table 2-X. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Salzburg Landfill Leachate Flow Volume Monitoring							
Cell 1 - 5	Closed Hazardous Waste Cells/ Lift Station 2A	Active Cells - monthly; Closed Cells - quarterly	No	None	None	None	**<u>Quarterly Flow Volume Monitoring</u>** The licensee shall tabulate and monitor the volume of leachate pumped from each leachate removal lift stations and the facility and record the volume by month. This data will be reported quarterly in the Quarterly Monitoring Reports. **<u>Annual Leachate Evaluations:</u>** *The annual leachate evaluation shall include; *Volume of leachate pumped from each leachate removal station *A graphical comparison between leachate quantities pumped/generated from each leachate removal lift station during the reported year and previous years *A description of changes in leachate quantities including system performance evaluation or cause for changes.
Cell 6 - 8	Closed Hazardous Waste Cells/ Lift Station 5						
Cell 9 - 10	Closed Hazardous Waste Cells/Lift Station 7						
Cell 11-12	Closed Hazardous Waste Cells/Lift Station 9						
Cell 13-14	Closed Hazardous Waste Cells/Lift Station 13						
Cell 15-16	Closed Hazardous Waste Cells/Lift Station 19						
Cell 17-19	Closed Hazardous Waste Cells/Lift Station 23						
Cell 20-22	Closed Hazardous Waste Cells/ Lift Station 25						
Cell 23-26	Active Hazardous Waste Cells/ Lift Station 27						
Cell 38-39	Closed Non-Hazardous Cells/ Lift Station 38						
Cell 40-43	Closed Non-Hazardous Cells/ Lift Station 22						

Table 2-Y. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Salzburg Landfill Leak Detection Monitoring							
Cell 3 - 5	Lift Station 3A	Quarterly	No	pH, Temp, Cond	VOA, EOA, TOC , DISSOLVED METALS (filtered), ANIONS	<u>Primary Constituents:</u> Acetone Acetonitrile Benzene Bromochloromethane Carbon tetrachloride Chlorobenzene Chloroform 1,2-Dibromoethane m-Dichlorobenzene o-Dichlorobenzene p-Dichlorobenzene 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene trans-1,2-Dichloroethylene 1,2-Dichloropropane Cis-1,3-Dichloropropene 1,4-Dioxane Ethylbenzene 2-Hexanone Isobutyl alcohol Chloromethane Dibromomethane Dichloromethane Methyl ethyl ketone 4-Methyl-2-pentanone Styrene 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene Trichlorofluoromethane Vinyl chloride o-Xylene m-Xylene p-Xylene Aniline Benzyl alcohol 2-Chlorophenol 3-Chlorophenol p-Chloro-m-cresol o-Cresol m-Cresol p-Cresol 2,4-Dichlorophenoxyacetic acid Hexachlorobenzene Bis (2-chloroisopropyl) ether 2,4-Dichlorophenol 2,6-Dichlorophenol Diethyl phthalate Dinoseb Hexachlorophene o-Nitrophenol Pentachlorophenol 2-Picoline 2,4,5-Trichlorophenoxyacetic acid 2,3,4,6-Tetrachlorophenol 1,2,4-Trichlorobenzene 2,4,5-Trichlorophenol 2,4,6-Trichlorophenol Naphthalene 4-Nitroquinoline Phenol Phorate Pyridine Silvex <u>Tracking Parameters:</u> Total Organic Carbon Cobalt Copper Selenium Vanadium Cyanide	**<u>QUARTERLY EVALUATION</u>** Detection Monitoring Performance Criteria for Primary Constituents Concentrations of Primary Constituents in each well will be compared to the approved reporting limits specified in Appendix B of the SAP. -Performance criteria have been met if measured concentrations of all constituents in all lift stations are less than their respective reporting limit. -Performance criteria are not being met if the measured concentration of a constituent in any lift station is equal to or greater than the respective reporting limit. Resample the well for the Primary Constituent in question, as soon as practicable but no less than two weeks between the original sampling event and confirmation sampling event. Confirmation samples should be collected in duplicate. **Confirmation that Performance Criteria are not being met:** It is confirmed that the performance criteria are not being met if atleast one of the two confirmation sample results are above the performance criterion. An evaluation of tracking parameter results versus UPLs (if applicable) will be performed and the results will be reported in each quarterly monitoring report with a summary of trends provided in the annual report. For tracking parameters, if only a single tracking parameter is detected above its performance criteria but less than 10 times its performance criteria and no primary parameters are detected, then confirmation sampling per the License is not required. However, reporting of such occurrences must be highlighted in the associated quarterly report. If results of the same single tracking parameter are above the performance criteria two quarters in a row, then confirmation sampling is required per the License. If a single tracking parameter is detected greater than ten times its performance criteria, or if more than one tracking parameter is detected above their respective performance criteria, and/or if any primary parameters is detected above its respective performance criteria, then notification requirements and confirmation sampling is required per the License. Develop Background Data UPLs will be developed for Metals and Anions using a minimum of eight results to establish a background dataset. Annually, results of monitoring data will be reviewed to determine if the background data and/or Performance Criteria should be updated. If Performance Criteria are updated, the new criteria will need to be reviewed and approved by the EGLE.
Cell 6 - 8	Lift Station 6						
Cell 9 - 10	Lift Station 8						
Cell 11-12	Lift Station 11						
Cell 13-14	Lift Station 12						
Cell 15-16	Lift Station 20						
Cell 17-19	Lift Station 21						
Cell 20-22 West LDS Drainage Header Cleanout	West LDS Drainage Header Cleanout						
Cells 23-26	Active Cells/Lift Station 28	Quarterly					
Future Cells	Future Cells	Eight samples collected prior to placing waste in the cell.					

Table 2-Y. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Salzburg Landfill Leak Detection Flow Volume Monitoring							
Cell 3 - 5	Lift Station 3A	Monthly	No	None	None	None	**<u>Record volume of flow on a monthly basis and provide to EGLE.</u>** **<u>MONTHLY FLOW EVALUATION</u>** Flow Rate Screening Criteria (FRSC) Measured flow for each cell will be tabulated monthly and compared to the FRSC for all monitored LDS cells. FRSC Response Action If monthly flow exceeds the FRSC: •Verbally notify the Chief of the EGLE, WMRP within five business days of the determination; •Schedule and perform a confirmation resample of the cell(s), for Primary Constituents; •Results of re-sampling will be evaluated and response will be according to the description above. If the monthly flow continues to exceed the established FRSC, and a statistically significant increase has not been detected, further investigation will be performed to determine if the FRSC should be revised for that LDS. Develop FRSC For future cells, a FRSC will be established within 24 months after the use of the new cells begin. The FRSC for each LDS will be established as the 95% upper tolerance limit (UTL) of the previous 24 months on a rolling average basis.
Cell 6 - 8	Lift Station 6						
Cell 9 - 10	Lift Station 8						
Cell 11-12	Lift Station 11						
Cell 13-14	Lift Station 12						
Cell 15-16	Lift Station 20						
Cell 17-19	Lift Station 21						
Cell 20-22 West LDS Drainage Header Cleanout	West LDS Drainage Header Cleanout						
Cells 20-22	Lift Station 26						
Cells 23-26	Active Cells/Lift Station 28						
Future Cells	TBD						

Table 2-Z. Sample Collection Chart

Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Salzburg Landfill Surface Water Monitoring							
001-B	Storm Water Runoff	Quarterly, dependent on rainfall sufficient to generate discharge	No	No	TOC, TOTAL METALS (unfiltered), ANIONS	**Primary Constituents** Cobalt Copper Selenium Vanadium Cyanide **Tracking Parameter** Total Organic Carbon	**QUARTERLY EVALUATION:** Duplicate samples shall be collected from each sampling location. Initially, analyze only one of the two samples, and hold the duplicate sample pending the results of the initial sample. **Surface Water Performance Criteria** Concentration of constituents will be compared to their performance criteria values, specified in Appendix J of the SAP. -Performance criteria are being met if the measured concentrations are less than or equal to the respective performance criteria value. -Performance criteria are not being met if the measured concentration of a constituent in any outfall is or greater than the respective performance criteria value. As soon as practicable, the duplicate sample shall be analyzed for confirmation purposes. **Confirmation that Performance Criteria are not being met:** It is confirmed that performance criteria are not met for a Primary Constituent if the duplicate sample is detected above the performance criteria value.
001-D	Storm Water Runoff						
001-E	Storm Water Runoff						

Table 2-AA. Sample Collection Chart

	Identifier	Site Info.	Frequency	SWL?	Field Parameters	Analysis Parameters	Specific Constituents	Data Evaluation/Response
Salzburg Landfill Groundwater Detection Program								
	4829	Till Clay Well	Semi-Annual (2nd and 4th qtrs.)	Yes	pH, Temp, Cond, & SWL	VOA, EOA, TOC, DISSOLVED METALS (filtered), ANIONS	**<u>Primary Constituents:</u>** Acetone Acetonitrile Benzene Bromochloromethane Carbon tetrachloride Chlorobenzene Chloroform 1,2-Dibromoethane m-Dichlorobenzene o-Dichlorobenzene p-Dichlorobenzene 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene trans-1,2-Dichloroethylene 1,2-Dichloropropane Cis-1,3-Dichloropropene 1,4-Dioxane Ethylbenzene 2-Hexanone Isobutyl alcohol Chloromethane Dibromomethane Dichloromethane Methyl ethyl ketone 4-Methyl-2-pentanone Styrene 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene Trichlorofluoromethane Vinyl chloride o-Xylene m-Xylene p-Xylene Aniline Benzyl alcohol 2-Chlorophenol 3-Chlorophenol p-Chloro-m-cresol o-Cresol m-Cresol p-Cresol 2,4-Dichlorophenoxyacetic acid Hexachlorobenzene *continued on next page*	**SEMIANNUAL EVALUATION:** **<u>Detection Monitoring Performance Criteria for Primary Constituents</u>** Concentrations of Primary Constituents in each well will be compared to the approved reporting limits specified in Appendix B of the SAP and well specific UPLs for metal compounds. -Performance criteria have been met if measured concentrations of all constituents in all wells are less than their respective reporting limit or UPL. -Performance criteria are not being met if the measured concentration of a constituent in any well is equal to or greater than the respective reporting limit. Resample the well, in duplicate, for the Primary Constituent in question, as soon as practicable. **Determine Statistically Significant Increase in Primary Parameter:** It is confirmed that the performance criteria are not being met if atleast one of the two confirmation sample results are above the performance criterion. **<u>Determine Statistically Significant Increase for a Tracking Parameter</u>** Temporal Stiff diagrams will evaluate relative percent difference for each of the compounds on the chart from previous monitoring period to current. Statistically significant increases will be recognized by at least three consecutive quarterly temporal plots diagrams showing the same sequential pattern. Tracking Parameters: Stiff diagrams or other geochemical graphical representations will be developed and reviewed annually. Sudden and/or unexpected changes in TOC may be further investigated, depending on results of other routine monitoring. If an exceedance is confirmed in any well the following actions must take place: • Notification should be made in accordance with License Conditions in IX.3; and • As soon as possible, sample the groundwater in the well where the statistically significant increase occured and other GlacialTtill and Regional Aquifer detection monitoring wells within 1,000 feet of the affected well and determine the concentration of all parameters identified in Appendix IX of 40 CFR, Part 264, that are present in the groundwater. Develop Background Data: UPLs will be developed for metals and anions without a UPLs after a minimum of eight results have been collected to establish a background dataset. Annually, results of monitoring data will be reviewed to determine if the background data and/or Performance Criteria should be updated. If Perforamnce Crtieria are updated, the new criteria will need to be reviewed and approved by EGLE. Sudden and/or unexpected changes in TOC may be further
	4830	Till Clay Well						
	4831	Till Clay Well						
	4832	Till Clay Well						
	4833	Till Clay Well						
	4834	Till Clay Well						
	4836	Till Sand Well						
	4837	Till Sand Well						
	4838	Till Clay Well						
	4839	Till Clay Well						
	4840	Till Clay Well						
	5949	Till Clay Well						
	5780	Till Clay Well						

	4666	Till Clay Well	Semi-Annual (2nd and 4th qtrs.)	Yes	pH, Temp, Cond, & SWL	VOA, EOA, TOC, DISSOLVED METALS (filtered), ANIONS	*continued from prior page* Bis (2-chloroisopropyl) ether 2,4-Dichlorophenol 2,6-Dichlorophenol Diethyl phthalate Dinoseb Hexachlorophene o-Nitrophenol Pentachlorophenol 2-Picoline 2,4,5-Trichlorophenoxyacetic acid 2,3,4,6-Tetrachlorophenol 1,2,4-Trichlorobenzene 2,4,5-Trichlorophenol 2,4,6-Trichlorophenol Naphthalene 4-Nitroquinoline Phenol Phorate Pyridine Silvex Copper Cobalt Selenium Vanadium Cyanide Tracking Parameters: chloride, carbonate alkalinity(CO3), bicarbonate alkalinity, sulfate (SO4), calcium, magnesium, potassium, sodium, iron Total Organic Carbon	ANNUAL EVALUATIONS: - A narrative summary of groundwater Primary Constituent and Tracking Parameter results, including Tracking Parameter trends. DEVELOP BACKGROUND DATA: UPLs will be developed for Primary Constituents, if necessary after a minimum of eight results have been collected to establish a background dataset. Annually, results of monitoring data will be reviewed to determine if the background data and/or Performance Criteria should be updated. If Performance Criteria are updated, the new criteria will need to be reviewed and approved by EGLE.
	4667	Till Clay Well						
	5213	Till Clay Well						
	5594	Till Clay Well						

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
Glacial Till and Reginal Aquifer Detection Monitoring						
	3794	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
	3796A	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	3856	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	3858	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	3860	Submersible Centrifugal				Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
	3862	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	3013	Submersible Centrifugal				Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
	2708	Submersible Centrifugal				Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
	3011	Submersible Centrifugal				Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
	C7-231	*Westbay System©	*Westbay System©		Zero Purge	*Westbay System©
	C7-241	*Westbay System©	*Westbay System©			*Westbay System©
	C7-251	*Westbay System©	*Westbay System©			*Westbay System©
	C7-261	*Westbay System©	*Westbay System©			*Westbay System©
	C7-271	*Westbay System©	*Westbay System©			*Westbay System©
	C8-210	*Westbay System©	*Westbay System©			*Westbay System©
	C9-239	Bladder pump	Fixed-Volume		3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
	C9-251	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	C9-278	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	C9-296	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	8614B	Peristaltic				Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
	8264G	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	8264I	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	8265F	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell
	8265G	None (Flowing)				Pressure Transducer, Multi-Probe Meter, Flow Through Cell

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs

*Groundwater samples collected from monitoring wells using the Schlumberger Westbay Multilevel MP-38 Groundwater Monitoring System (Westbay System©) are collected using a zero purge method.

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
Salzburg Landfill Glacial Till Wells						
	4829	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
	4830					
	4831					
	4832					
	4833					
	4834					
	4836					
	4837					
	4838					
	4839					
	4840					
	5949					
	5780					
	4666					
	4667					
	5213					
	5594					

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
Sludge Dewatering Facility (SDF) Groundwater Monitoring						
	4506	Peristaltic	Low Flow Purge	No	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
	4507					
	3775					
	3776					
	3777					
	3778					
	3779					
	5487					
	3916					
	3922					

Table 3. Well Purging Information

Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
Poseyville Landfill Detection Monitoring					
2438	None (Flowing)	Fixed-Volume	No	3 Well Volumes	Pressure Transducer, Multi-Probe Meter, Flow Through Cell
2684	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
2686	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
2692	None (Flowing)	Fixed-Volume	No	3 Well Volumes	Pressure Transducer, Multi-Probe Meter, Flow Through Cell
2693	None (Flowing)	Fixed-Volume	No	3 Well Volumes	Pressure Transducer, Multi-Probe Meter, Flow Through Cell
2969	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
2968	Peristaltic	Low Flow Purge	No	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
2985	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
2986	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
2991	None (Flowing)	Fixed-Volume	No	3 Well Volumes	Pressure Transducer, Multi-Probe Meter, Flow Through Cell
2992	None (Flowing)	Fixed-Volume	No	3 Well Volumes	Pressure Transducer, Multi-Probe Meter, Flow Through Cell
2994	None (Flowing)	Fixed-Volume	No	3 Well Volumes	Pressure Transducer, Multi-Probe Meter, Flow Through Cell
2995	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
2996	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
2998	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
2999	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell
3004	None (Flowing)	Fixed-Volume	No	3 Well Volumes	Pressure Transducer, Multi-Probe Meter, Flow Through Cell
4505	Submersible Centrifugal	Fixed-Volume	No	3 Well Volumes	Controller, Generator, SWL Meter, Muli-Probe Meter, Flow Through Cell

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
Poseyville Landfill Corrective Action Monitoring						
	2690-A	Submersible Centrifugal	Purge Lines Only	Yes	N/A	SWL Meter
	2917					
	2960					
	2961					

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
Poseyville Landfill Corrective Action Monitoring Plume Perimeter						
	3283	Peristaltic	Low Flow Purge	Yes	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
	2907					
	2902					
	5925					
	6174					
	2691					Controller, Generator, SWL Meter, Multi-Probe Meter, Flow Through Cell
	2688					
7th Street Purge Well Area Chemical Monitoring						
	PW-1	Submersible Centrifugal	Purge Lines Only	Yes	N/A	SWL Meter
	PW-2					
	PW-3					
	PW-4					
	LS 121					
7th Street Purge Well Area Corrective Action Monitoring						
	MW-1	Peristaltic	Low Flow Purge	Yes	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
	MW-6					
	MW-12					
	MW-14S					
	MW-15S					
	MW-16					
	MW-17					
	MW-18					
T-Pond Recovery Monitoring						

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
	3795	Peristaltic	Low Flow Purge	Yes	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
Northeast Perimeter Groundwater Monitoring						
	5383	Peristaltic	Low Flow Purge	Yes	Field Parameter Stabilization	
	6176					
	6177					
	4355					
	4358					
	4363					
	3540A					
	6175					
	6178					
	(MW-A)					
	(MW-B)					
	(MW-C)					
	(MW-D)					
	(MW-F)					
	(MW-G)					
	(MW-H)					
	(MW-I)					
	(MW-J)					
	(MW-K)					
	(MW-1)					
	(MW-2)					
	(MW-2B)					
	(MW-3)					
	(MW-3B)					
	(MW-4)					
	(MW-4B)					
	(MW-5)					
	(MW-6)					
	(MW-7)					
	(MW-8)					
	(MW-9)					
	(MW-10)					

Table 3. Well Purging Information

	Identifier	Pump Type	Purge Method	Containerize Purge Water?	Min. Volume	Equipment Needs
Ash Pond Area Groundwater Detection Monitoring						
	6165 6166 6167 6168 6169	Peristaltic	Low Flow Purge	No	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
West Plant Perimeter Along Poseyville Road						
	6278 6280 6518 6582 6520 6545 6546 6552	Peristaltic	Low Flow Purge	Yes	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
Former 47 Building Surface Water Protection Monitoring						
	F47-MW-11 F47-MW-12	Peristaltic	Low Flow Purge	Yes	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter
Overlook Park						
	8915	Peristaltic	Low Flow Purge	Yes	Field Parameter Stabilization	Pump, Power Supply, Multi-Probe Meter, Flow Through Cell, SWL Meter

Table 4. Monitoring Well Specifications

Glacial Till and Regional Aquifer Detection Monitoring Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	X NAD83 Coordinates	Aquifer Intercepted
3794	2"	Stainless Steel	5'	56' - 61'	618.52	X 13155684.0354 Y 761130.6888	Till Sand
3796A	2"	Stainless Steel	5'	82' - 87'	621.24	X 13155595.0651 Y 762025.9672	Till Sand
3856	2"	Stainless Steel	5'	163'- 168'	618.58	X 13157600.5673 Y 759571.4097	Glacial Till
3858	2"	Stainless Steel	5'	183' - 188'	616.05	X 13158385.4237 Y 764447.3670	Regional
3860	2"	Stainless Steel	5'	178' - 183'	627.20	X 13161183.2640 Y 764796.7043	Regional
3862	2"	Stainless Steel	5'	198' - 203'	625.03	X 13164220.5857 Y 761804.1754	Regional
3013	4"	Stainless Steel	4'	191.2' - 196.2'	623.87	X 13166217.1045 Y 758653.4100	Regional
2708	4"	Stainless Steel	4'	137' - 142'	623.89	X 13167530.5423 Y 758853.1700	Regional
3011	4"	Stainless Steel	4'	117' - 122'	627.36	X 13170529.3799 Y 759027.3329	Regional
C7-231	4"	PVC	4'	227'-232'	630.34	X 13163864.1381 Y 767720.2614	Regional
C7-241	4"	PVC	4'	236'-242'	630.34	X 13163864.1381 Y 767720.2614	Regional
C7-251	4"	PVC	4'	247'-252'	630.34	X 13163864.1381 Y 767720.2614	Regional
C7-261	4"	PVC	4'	257'-262'	630.34	X 13163864.1381 Y 767720.2614	Regional
C7-271	4"	PVC	4'	267'-272'	630.34	X 13163864.1381 Y 767720.2614	Regional
C8-210	4"	PVC	4'	206'-211'	631.95	X 13165671.0674 Y 764401.4622	Regional
C9-239	1"	PVC	5'	234'-239'	619.68	X 13165630.2690 Y 760035.4859	Regional
C9-251	1"	PVC	5'	246'-251'	619.57	X 13165630.2690 Y 760035.4859	Regional
C9-278	1"	PVC	5'	273'-278'	619.84	X 13165630.2690 Y 760035.4859	Regional
C9-296	1"	PVC	5'	291'-296'	619.39	X 13165630.2690 Y 760035.4859	Regional
8614B	1"	Stainless Steel	5'	264'-269'	632.49	X 13158099.9358 Y 767953.3759	Regional
8264G	1"	PVC	5'	205'-210'	624.18	X 13159806.4306 Y 765846.4445	Regional
8264I	1"	PVC	5'	250'-255'	624.16	X 13159806.4306 Y 765846.4445	Regional
8265F	1"	Stainless Steel	5'	196'-201'	625.87	X 13160153.3018 Y 765112.8696	Regional
8265G	1"	Stainless Steel	5'	215'-220'	625.90	X 13160153.3018 Y 765112.8696	Regional

Top of Casing surveyed in 2015.

Table 4. Monitoring Well Specifications

Salzburg Landfill Glacial Till Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
4829	4"	Stainless Steel	3'	37.0' - 40.0'	625.71	X 13168180.3003 Y 759130.5380	Till Clay
4830	4"	Stainless Steel	3'	36.0' - 39.0'	625.14	X 13167886.4786 Y 758985.1910	Till Clay
4831	4"	Stainless Steel	3'	25.5' - 28.5'	626.53	X 13168001.2200 Y 758360.3392	Till Clay
4832	4"	Stainless Steel	3'	25.4' - 28.4'	627.40	X 13168267.1814 Y 758388.6551	Till Clay
4833	4"	Stainless Steel	3'	37.0' - 40.0'	625.86	X 13168996.4131 Y 757341.5424	Till Clay
4834	4"	Stainless Steel	3'	37.0' - 40.0'	625.38	X 13169606.0282 Y 756814.2776	Till Clay
4836	4"	Stainless Steel	10'	49.0' - 59.0'	627.11	X 13170413.6891 Y 757086.2322	Till Sand
4837	4"	Stainless Steel	7'	50.0' - 63.0'	630.39	X 13170479.2087 Y 757489.3023	Till Sand
4838	4"	Stainless Steel	3'	36.0' - 39.0'	631.00	X 13170531.4958 Y 758088.3530	Till Clay
4839	4"	Stainless Steel	3'	36.0' - 39.0'	629.32	X 13170535.6840 Y 758771.3451	Till Clay
4840	4"	Stainless Steel	3'	37.0' - 40.0'	631.02	X 13169535.1963 Y 759197.1481	Till Clay
5949	4"	Stainless Steel	10'	60.6' - 70.6	628.55	X 13170334.8791 Y 759199.2986	Till Clay
5780	4"	Stainless Steel	10'	60.0' - 70.0'	628.83	X 13169216.9029 Y 759204.8601	Till Clay
4666	4"	Stainless Steel	10'	60.0' - 70.0'	628.26	X 13168972.2014 Y 759201.4786	Till Sand
4667	4"	Stainless Steel	10'	60.0' - 70.0'	623.54	X 13168499.7335 Y 759181.7170	Till Clay
5213	4"	Stainless Steel	5'	37.9' - 42.9'	624.23	X 13170044.5045 Y 756658.7018	Till Clay
5594	4"	Stainless Steel	5'	40.0' - 45.0'	625.06	X 13169489.6299 Y 757151.1326	Till Clay

Top of Casing surveyed in 2015.

Table 4. Monitoring Well Specifications

Sludge Dewatering Facility Groundwater Monitoring

1. Perimeter Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
3775	2"	Stainless Steel	5'	14.0' - 19.0'	620.01	X 13166642.5441 Y 759285.4049	Lakebed Clay
3776	2"	Stainless Steel	5'	16.9' - 21.9'	625.70	X 13167303.5958 Y 758811.8006	Lakebed Clay
3777 [1]	2"	Stainless Steel	5'	16.5' - 21.5'	627.58	X 13167958.4441 Y 758172.6918	Lakebed Clay
3778	2"	Stainless Steel	5'	11.0' - 16.0'	623.34	X 13167051.1210 Y 758038.5146	Lakebed Clay
3779	2"	Stainless Steel	5'	13.0' - 18.0'	622.57	X 13166205.8894 Y 758288.4835	Lakebed Clay
5487	2"	Stainless Steel	5'	12.0'- 17.0'	621.11	X 13166186.2272 Y 758886.7689	Lakebed Clay
3916	2"	Stainless Steel	5'	7.5' - 12.5'	619.00	X 13166254.5469 Y 759289.0429	Lakebed Clay
3922	2"	Stainless Steel	5'	14.0'- 19.0'	632.65	X 13166351.6044 Y 758315.5764	Lakebed Clay

Top of Casing surveyed in 2012.

[1] Top of Casing surveyed in 2015.

2. Detection Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
4506	2"	Stainless Steel	5'	30' - 35'	623.40	X 13166587.4971 Y 758905.8464	Glacial Till
4507	2"	Stainless Steel	5'	30' - 35'	622.92	X 13166896.8654 Y 758591.6205	Glacial Till

Top of Casing surveyed in 2012.

Table 4. Monitoring Well Specifications

Poseyville Landfill Monitoring

1. Detection Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
2438 [1]	2"	unknown	unknown	7.75'	610.23	X 13154701.8431 Y 764394.4597	Till Sand
2684	2"	Stainless Steel	2'	23.0'- 25.0'	610.34	X 13154627.8598 Y 763296.0882	Glacial Till
2686	2"	Stainless Steel	2'	18.5' - 20.5'	612.62	X 13153441.8147 Y 763265.9676	Glacial Till
2688	2"	Stainless Steel	2'	20.0'-22.0'	620.78*	X 13154787.0959 Y 764098.7664	Till Sand
2691	2"	Stainless Steel	2'	22.5'-24.5'	610.33*	X 13153942.9329 Y 764662.9465	Till Sand
2692	2"	Stainless Steel	2'	19.5'- 21.5'	612.98	X 13152821.8858 Y 764632.9033	Till Sand
2693	2"	Stainless Steel	2'	19.5' - 21.5'	612.29	X 13151414.9466 Y 764599.8164	Till Sand
2968	2"	Stainless Steel	2'	71.5' - 73.0'	635.89	X 13149921.3311 Y 764048.3322	Till Sand
2969	2"	Stainless Steel	2'	58.0'-60.0'	614.36	X 13152168.2083 Y 764622.2996	Clay Till
2985	2"	Stainless Steel	2'	37.0'-39.0'	613.74	X 13150934.5452 Y 764607.0399	Clay Till
2986	2"	Stainless Steel	2'	56.0'-58.0'	633.66	X 13149930.7817 Y 763506.352044	Clay Till
2991	2"	Stainless Steel	2'	19.25'-21.25'	613.39	X 13152185.0274 Y 764606.1400	Till Sand
2992 [1]	2"	Stainless Steel	3'	123.3'-126.3'	612.91	X 13151427.4406 Y 764604.6313	Till Sand
2994	2"	Stainless Steel	3'	86.0'-89.0'	615.91	X 13150093.2165 Y 764724.7283	Till Sand
2995	2"	Stainless Steel	2'	63.0'-65.0'	624.31	X 13149653.2691 Y 764603.1019	Clay Till
2996	2"	Stainless Steel	2'	58.5'-60.5'	611.76	X 13153614.9697 Y 763301.2746	Clay Till
2998	2"	Stainless Steel	3'	47.0'-50.0'	628.79	X 13150969.4395 Y 763361.3011	Clay Till
2999	2"	Stainless Steel	3'	43.0'-46.0'	624.73	X 13152456.3990 Y 763375.4845	Clay Till
3004 [1]	2"	Stainless Steel	2'	59.0'-61.0'	612.70	X 13151435.0481 Y 764598.3406	Till Sand
4505	2"	Stainless Steel	5'	31.0'-36.0'	627.59	X 13151842.4926 Y 763388.9481	Till Sand

Top of Casing surveyed in 2011.

[1] Top of Casing surveyed in 2015.

* 2688 and 2691 are part of the Detection and Corrective Action Monitoring Programs

Table 4. Monitoring Well Specifications

Poseyville Landfill Monitoring

2. Corrective Action Monitoring Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
2690A	4"	Stainless Steel	4'	21'-24'	609.02	X 13154426.1221 Y 764665.9253	Till Sand
2917	8"	PVC	10'	13'-23'	608.33	X 13154598.8243 Y 764661.9323	Till Sand
2960	12"	Stainless Steel	6'	18'-24'	608.8	X 13154333.4118 Y 764759.1129	Till Sand
2961	12"	Stainless Steel	4'6"	16.5'-21.0'	610.42	X 13154792.9899 Y 764437.6682	Till Sand
3283	1.25"	PVC	3'	13.3'	608.76	X 13153929.4637 Y 765054.7245	Till Sand
2907	1.25"	Galvanized Steel	2'6"	24.0'	609.08	X 13154433.9045 Y 765014.4294	Till Sand
2902	1.25"	Galvanized Steel	1'6"	17.0'	607.2	X 13154801.3570 Y 764799.0728	Till Sand
5925	2'	PVC	3'	23.6'	608.64	X 13154788.4008 Y 764612.3501	Till Sand
6174	2'	Stainless Steel	3'	21.0'	614.18	X 13154691.8109 Y 766675.6145	Till Sand
2691	2'	Stainless Steel	2'	22.5'-24.5'	610.33*	X 13153942.9329 Y 764662.9465	Till Sand
2688	2'	Stainless Steel	2'	20.0'-22.0'	620.78*	X 13154787.0959 Y 764098.7664	Till Sand

Top of Casing surveyed in 2011.

* 2688 and 2691 are part of the Detection and Corrective Action Monitoring Programs

Table 4. Monitoring Well Specifications

7th Street Purge Wells Area

1. Purge Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Aquifer Intercepted
PW-1	12"	Stainless Steel	23'	61.0'	Till Sand
PW-2	12"	Stainless Steel	35'	74.0'	Till Sand
PW-3	12"	Stainless Steel	25'	68.0'	Till Sand
PW-4	12"	Stainless Steel	25'	73.0'	Till Sand
LS 121	8"	Stainless Steel	250'	30'	Till Sand

2. Shallow Monitoring Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
MW-1	2"	PVC	5'	15.3'	619.35	X 13156874.6791 Y 766342.6323	Surface Sand
MW-6	2"	PVC	5'	14.3'	615.86	X 13156939.2587 Y 766191.7117	Surface Sand
MW-12	2"	PVC	10'	15.8'	617.28	X 13156882.9522 Y 766281.4430	Surface Sand
MW-14S	2"	PVC	3'	6.4'	607.83	X 13156933.0101 Y 766240.8035	Surface Sand
MW-15S	2"	PVC	3'	6.8'	607.69	X 13156922.2720 Y 766264.3903	Surface Sand
MW-16	2"	PVC	5.6'	20.6'	623.49	X 13156937.5184 Y 766058.3115	Surface Sand
MW-17	2"	PVC	5'	16.0'	616.73	X 13156905.0171 Y 765892.5750	Surface Sand
MW-18	2"	PVC	5'	20.0'	618.07	X 13156945.4404 Y 765956.2224	Surface Sand

Top of Casing surveyed in 2014.

Teritiary Pond Recovery Monitoring

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
3795	2"	Stainless Steel	5'	10.2' - 15.2'	621.71	X 13155585.8872 Y 761840.5593	Surficial Sand

Top of Casing surveyed in 2015.

Table 4. Monitoring Well Specifications

Northeast Perimeter Monitoring Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
5385	2"	Stainless Steel	3'	10.5'	630.09	X 13162305.2359 Y 768828.8877	Surface Sand
6175	2"	Stainless Steel	3'	8.7'	628.15	X 13162892.3067 Y 768260.3954	Surface Sand
6176	2"	Stainless Steel	3'	8.6'	632.41	X 13165252.2140 Y 766382.0341	Surface Sand
6177	2"	Stainless Steel	3'	14.0'	632.72	X 13162652.5793 Y 767447.7201	Surface Sand
6178	2"	Stainless Steel	3'	16.5'	635.32	X 13162929.8460 Y 767137.1551	Surface Sand
4355	2"	PVC	5'	13.0'	636.08	X 13163488.8364 Y 767138.8217	Surface Sand
4358	2"	PVC	5'	6.0'	628.98	X 13164639.8334 Y 767128.1940	Surface Sand
4363	2"	PVC	5'	6.5'	630.84	X 13165387.9914 Y 765644.0064	Surface Sand
3540A	2"	Stainless Steel	3'	7.0'	633.27	X 13165039.9066 Y 766810.3752	Surface Sand
(MW-A)	2"	Stainless Steel	3'	18.0'	637.41	X 13162828.9831 Y 767107.2351	Surface Sand
(MW-B)	2"	Stainless Steel	3'	16.0'	637.29	X 13162879.7821 Y 767107.4957	Surface Sand
(MW-C)	2"	Stainless Steel	3'	16.0'	637.53	X 13162758.6768 Y 767113.2512	Surface Sand
(MW-D)	2"	Stainless Steel	3'	16.0'	637.21	X 13162685.7777 Y 767113.3642	Surface Sand
(MW-F)	2"	Stainless Steel	3'	16.0'	636.28	X 13162818.8440 Y 767140.1226	Surface Sand
(MW-G)	2"	Stainless Steel	3'	16.0'	636.64	X 13162770.0439 Y 767140.7644	Surface Sand
(MW-H)	2"	Stainless Steel	3'	16.0'	634.26	X 13162838.8895 Y 767185.5459	Surface Sand
(MW-I)	2"	Stainless Steel	3'	16.0'	637.05	X 13162794.6313 Y 767067.1947	Surface Sand
(MW-J)	2"	Stainless Steel	3'	16.0'	636.64	X 13162797.7803 Y 767026.0990	Surface Sand
(MW-K)	2"	Stainless Steel	3'	16.0'	636.75	X 13162800.5246 Y 766988.9028	Surface Sand
(MW-1)	1"	PVC	5'	7.8'	626.39	X 13164147.5298 Y 767136.8071	Surface Sand
(MW-2)	1"	PVC	5'	8.1'	627.73	X 13164077.0253 Y 767141.4230	Surface Sand
(MW-2B)	2"	PVC	3'	6.0'	630.25	X 13164076.6995 Y 767163.0223	Surface Sand
(MW-3)	1"	PVC	5'	9.8'	627.99	X 13163966.9182 Y 767148.5916	Surface Sand
(MW-3B)	2"	PVC	3'	6.0'	630..92	X 13163977.3008 Y 767163.1038	Surface Sand
(MW-4)	1"	PVC	5'	12.5	629.66	X 13163896.0276 Y 767141.5072	Surface Sand
(MW-4B)	2"	PVC	3'	6.0'	632.11	X 13163897.2996 Y 767165.0084	Surface Sand
(MW-5)	2"	PVC	3'	11.63	630.82	X 13163774.0182 Y 767150.8616	Surface Sand
(MW-6)	1"	PVC	5'	12.3'	629.87	X 13163932.0859 Y 767092.2509	Surface Sand

Table 4. Monitoring Well Specifications

(MW-7)	1"	PVC	5'	12.1'	631.52	X 13163772.2177 Y 767067.3606	Surface Sand
(MW-8)	2"	PVC	3'	13.9'	632.74	X 13163724.0683 Y 767025.5038	Surface Sand
(MW-9)	2"	PVC	3'	10.0'	630.48	X 13164106.1717 Y 767018.2594	Surface Sand
(MW-10)	2"	PVC	5'	10.0'	628.39	X 13164129.1637 Y 767276.3833	Surface Sand

Top of Casing surveyed in 2013.

Table 4. Monitoring Well Specifications

Ash Pond Area Monitoring Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
6165	2"	PVC	5'	20.0'	608.23	X 13156765.4480 Y 768041.3785	Surface Sand
6166	2"	PVC	5'	18.5'	609.27	X 13156826.2123 Y 767736.2552	Surface Sand
6167	2"	PVC	5'	18.0'	607.49	X 13156865.7218 Y 767393.5071	Surface Sand
6168	2"	PVC	5'	14.0'	606.03	X 13156882.2328 Y 767049.8315	Surface Sand
6169	2"	PVC	5'	10.0'	606.14	X 13156891.5701 Y 766684.2477	Surface Sand

Top of Casing surveyed in 2007.

Former 47 Building Area Surface Water Protection Monitoring Wells

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
F47-MW-11	2"	PVC	5'	10'	627.50	X 13157179.1995 Y 768478.6479	Surface Sand
F47-MW-12	2"	PVC	5'	17'	625.89	X 13157285.2107 Y 768242.3877	Surface Sand

Top of Casing surveyed in 2013.

RGIS East Deep Well 5964

1. Purge Well

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Dow Coordinates	Aquifer Intercepted
5964	8"	PVC	20'	93.3'	X Y	Till Sand

Overlook Park

Well	Diameter	Screen Mat'l	Length of Screen	Depth	Top of Casing (TOC)	Dow Coordinates	Aquifer Intercepted
8915	2"	PVC	5'	79.5'	628.10	X 13155374.4303 Y 760721.7252	Till Sand

Top of Casing surveyed in 2014.

Table 5. RGIS Piezometer Specification Table

Cluster	Piezo	Piezo Location	Elevation TOC*	Top of Screen	Bottom of Screen	X NAD83	Y NAD83
AZ	6532 [2]	O	600.48	588.6	585.6	13157263.5123	766394.3339
	6533	P	600.19	587.7	584.7	13157267.5126	766394.0386
	6534 [2]	I	600.35	589.4	586.4	13157273.4129	766393.6457
	6535	D	600.37	564.2	561.2	13157273.4129	766393.6457
BA	6536 [1]	O	600.11	588.4	585.4	13157255.0121	765893.0307
	6537	P	599.83	588.2	585.2	13157259.9097	765894.9366
	6538 [1]	I	600.16	588.4	585.4	13157274.3070	765897.0538
BB	8572	O	601.79	597.3	594.3	13158621.4176	763028.0079
	8574	I	605.69	597.2	594.2	13158509.5746	762898.1762
	8573	P	603.71	595.0	592.0	13158591.3626	762990.7725
BC	8575	O	597.08	590.4	587.4	13159345.7845	762543.9814
	8577	I	597.27	593.0	590.0	13159303.0499	762489.8312
	8576	P	596.86	589.8	586.8	13159312.5419	762496.4425
U	4013	I	600.77	585.9	582.9	13159617.5643	762138.7128
	5253	I	599.76	561.9	558.9	13159586.0720	762300.0725
	5258	P	595.19	583.0	580.0	13159588.5679	762303.4754
	5259	O	598.17	580.2	577.2	13159638.1390	762327.0343
V	4012	I	603.84	596.8	593.8	13159887.6409	762070.9366
	5260	P	599.15	584.1	581.1	13159903.3321	762078.0552
	5262	O	601.73	589.7	586.7	13159914.4114	762095.2682
W	5263	I	600.55	589.9	586.9	13162202.0600	761771.5049
	5264	P	596.47	585.8	582.8	13160312.5984	761514.5535
	5266	O	599.01	586.6	583.6	13160329.2473	761808.2684
X	5267	I	604.01	587.5	584.5	13160829.5880	761432.2723
	5268	P	600.67	588.2	585.2	13160834.5720	761445.578
	5269	O	602.90	590.2	587.2	13160842.9547	761459.9878
Y	5509 [1]	O	594.29	585.4	582.4	13157694.7928	764231.6812
	5510	P	595.37	583.2	580.2	13157698.3857	764237.5854
	5511 [1]	I	594.69	587.8	584.8	13157702.9836	764239.2909
Z	5512 [1]	O	594.05	582.7	579.7	13158548.2622	763577.2118
	5513	P	595.22	583.4	580.4	13158550.3566	763581.9142
	5514 [1]	I	594.45	583.2	580.2	13158284.4532	763588.1962
AA	5515 [1]	O	593.97	583.7	580.7	13159060.1473	763248.3288
	5516	P	595.07	582.3	579.3	13159061.9401	763254.3308
	5517 [1]	I	594.59	584.9	581.9	13159065.4359	763257.835
AB	5681 [1]	O	594.33	583.8	580.8	13161488.8784	761514.758
	5682	P	594.39	581.0	578.0	13161491.4645	761526.3609
	5683 [1]	I	594.70	583.1	580.1	13161493.3573	761532.3631

Table 5. RGIS Piezometer Specification Table

Cluster	Piezo	Piezo Location	Elevation TOC*	Top of Screen	Bottom of Screen	X NAD83	Y NAD83
AC	5770 [1]	O	593.78	586.0	583.0	13161978.2014	761404.8439
	5771	P	593.89	581.5	578.5	13161978.1957	761409.5438
	5772 [1]	I	593.79	583.0	580.0	13161978.5894	761414.8442
AD	5773 [1]	O	594.29	584.0	581.0	13162470.7555	761352.5326
	5774	P	594.61	592.1	579.1	13162471.4494	761357.6333
	5775 [1]	I	594.21	584.5	581.5	13162471.9429	761363.0338
AE	5831 [1]	O	593.88	583.3	580.3	13164049.0362	760423.6308
	5832	P	593.94	581.8	578.8	13164054.9315	760427.5378
	5833 [1]	I	593.98	580.2	577.2	13164058.8278	760430.5424
AF	5834 [1]	O	593.78	581.0	578.0	13164411.9833	760127.1687
	5835	P	594.07	580.0	577.0	13164416.6749	760134.1742
	5836 [1]	I	593.97	581.1	578.1	13164418.9705	760137.7768
AG	5950 [1]	O	594.51	585.8	592.8	13163025.2167	761293.295
	5951	P	394.47	582.3	579.3	13163026.0092	761299.5958
	5952 [1]	I	594.69	587.3	584.3	13163027.7030	761304.7978
AH	5953 [1]	O	594.59	585.8	582.8	13163440.0852	761062.2937
	5954	P	594.58	585.4	582.4	13163442.6782	761068.0967
	5955 [1]	I	594.60	586.2	583.2	13163445.0729	761072.4995
AI	5956 [1]	O	594.39	588.7	585.7	13163739.0015	760792.7548
	5957	P	594.43	588.1	585.1	13163743.3970	760796.46
	5958 [1]	I	594.52	589.1	586.1	13163747.0932	760799.5643
AJ	5970 [1]	O	594.36	582.8	579.8	13160887.4334	761812.135
	5971	P	594.31	581.0	578.0	13160890.7274	761817.1388
	5972 [1]	I	594.43	582.3	579.3	13160893.4227	761821.042
AK	5973 [1]	O	594.48	584.3	581.3	13160370.1635	762212.8106
	5974	P	594.48	583.3	580.3	13160374.0578	762217.5152
	5975 [1]	I	594.06	583.4	580.4	13160376.4532	762221.318
AL	5976 [1]	O	595.16	587.7	584.7	13159912.4521	762563.4582
	5977	P	595.05	588.1	579.5	13159916.0476	762567.1624
	5978 [1]	I	595.28	588.2	585.2	13159920.8419	762571.8681
AM	5979 [1]	O	594.88	581.4	578.4	13159507.9199	762930.5689
	5980	P	594.20	580.8	577.8	13159511.7157	762934.0734
	5981	D	594.12	537.1	534.1	13159513.2123	762936.8752
	5982 [1]	I	594.83	581.7	578.7	13159513.6118	762937.2756
AN	5983 [1]	O	596.22	581.8	578.8	13159300.2325	763090.2182
	5984	P	596.18	581.1	578.1	13159302.9272	763094.6214
	5985	D	596.27	553.5	550.5	13159306.0217	763099.125
	5986 [1]	I	596.34	581.8	578.8	13159306.4215	763099.3255
AO	5987 [1]	O	595.69	581.3	578.3	13159154.0380	763171.2422
	5988	P	595.38	582.2	579.2	13159182.6346	763173.6764
	5989 [1]	I	595.91	582.9	579.9	13159185.0304	763177.1792
	5990	D	595.84	574.7	571.7	13159185.2301	763177.3794

Table 5. RGIS Piezometer Specification Table

Cluster	Piezo	Piezo Location	Elevation TOC*	Top of Screen	Bottom of Screen	X NAD83	Y NAD83
AP	5991 [1]	O	595.05	585.2	582.2	13158148.8672	763829.1303
	5992	P	594.94	585.6	582.6	13158150.2611	763834.2319
	5993 [1]	I	595.28	587.5	584.5	13158152.0569	763837.734
AQ	5995	P	600.48	594.2	591.2	13157261.9879	765829.54
	5996 [1]	I	599.98	593.2	590.2	13157267.2882	765829.2463
AT	6005	O	609.99	597.4	594.4	13165352.6651	760212.4882
	6006	P	608.43	594.9	591.9	13165333.4622	760215.1653
	6207 [1]	I	609.62	595.7	592.7	13165316.6673	760211.1453
AU	6112 [1]	O	596.87	579.8	576.8	13157402.5161	764717.5243
	6113	P	596.68	583.1	580.1	13157408.1128	764720.2309
	6114 [1]	I	596.40	584.8	581.8	13157412.5117	764721.0362
AV	6109 [1]	O	597.50	584.4	581.4	13157321.7817	764998.0236
	6110	P	5997.55	584.1	581.1	13157327.8803	764999.1308
	6111 [1]	I	597.49	584.7	581.7	13157331.3790	765000.235
AW	6106 [1]	O	603.21	587.9	584.9	13157253.9272	765378.8368
	6107	P	603.03	588.7	585.7	13157258.4257	765380.0422
	6108 [1]	O	603.06	589.0	586.0	13157263.7250	765380.5485
AX	6196 [1]	O	598.37	583.8	580.8	13164977.8199	759920.2467
	6197	P	598.31	579.8	576.8	13164979.3258	759915.2486
	6198 [1]	I	598.08	582.4	579.4	13164980.2325	759909.6498
AY	3977	O	601.39	597.8	594.8	13158252.7107	763456.8603
	3978	O	604.61	597.1	594.1	13158197.4850	763395.4952
	6192	P	603.71	595.6	592.6	13158331.0803	763230.3576
	3979	I	605.14	595.8	592.8	13158092.2141	763288.871
	3980	I	605.52	596.5	593.5	13158084.7287	763276.7623
TA	5218	O	619.41	604.5	601.5	13155784.2070	761069.646
	5219	P	618.19	603.6	600.6	13155775.7140	761063.9359
	5220**	O	616.28	606.0	603.0	13155725.6399	760959.4778

Table 5. RGIS Piezometer Specification Table

Cluster	Piezo	Piezo Location	Elevation TOC*	Top of Screen	Bottom of Screen	X NAD83	Y NAD83
TB	5221	I	619.05	604.2	601.2	13156361.5843	760579.0455
	5222	P	615.67	---	---	13156353.1983	760567.5357
	5224	O	613.55	605.0	602.0	13156340.5239	760546.3209
TC	5225**	I	618.89	603.9	600.9	13156818.1172	760377.7953
	5226**	P	614.10	---	---	13156807.2470	760353.0828
	5228	O	613.34	606.0	603.0	13156797.8755	760329.372
TD	5229	I	619.83	607.1	604.1	13157517.8564	759665.945
	5230	P	620.17	605.0	602.0	13157502.0768	759649.1264
	5232**	O	618.14	604.3	601.3	13157496.1870	759640.7195
TE	5233	I	619.01	603.3	600.3	13157885.7277	759517.1876
	5234	P	607.63	---	---	13157887.3607	759489.5901
	5235	O	606.24	596.3	593.3	13157882.5879	759466.8848
TF	5236	I	618.35	609.4	606.4	13158462.9112	759522.3777
	5238	P	613.36	---	---	13158463.6275	759508.6788
	5240	O	611.77	608.9	605.9	13158463.7337	759503.479
TG	5241	I	618.74	608.9	605.9	13158960.7929	759530.1727
	5242	I	619.23	604.5	601.5	13158960.6917	759531.1726
	5243	P	613.06	605.8	602.8	13158959.6136	759512.8716
	5245	O	610.18	607.1	604.1	13158960.5219	759505.8728
TH	5246	I	619.69	608.2	605.2	13159740.4984	759848.5988
	5247	P	614.40	603.4	600.4	13159754.5110	759837.9157
	5249	O	611.21	608.2	605.2	13159761.8170	759832.7246
TI	4965	I	618.24	603.3	600.3	13160360.7099	760667.0254
	4965A	I	618.28	595.3	592.3	13160361.9093	760667.5268
	5250	I	613.02	---	---	13160381.9122	760664.7507
	5252	O	609.22	590.4	587.4	13160387.7251	760653.8579
	5257	O	612.27	596.6	593.6	13160381.6198	760658.4505
TJ	5254	I	619.63	609.6	606.6	13160527.2702	761116.5166
	5255	P	620.47	601.3	598.3	13160545.1865	761102.6382
	4823	O	601.25	601.6	598.6	13160551.2181	761076.0459
101A	9006 [3]	P	601.24	592.81	589.81	13157100.9009	768077.4168
	9007 [3]	O	601.19	590.09	585.09	13157105.2997	768078.4221
101C	9008 [3]	P	600.68	587.75	582.72	13157257.5634	767187.6159
	9009 [3]	O	600.36	587.38	582.38	13157264.5628	767188.0243
102A	9010 [3]	P	600.09	585.47	583.47	13157274.0121	766561.5441
	9011 [3]	D	599.87	541.08	536.08	13157282.2109	766562.4539
	9012 [3]	I	600.13	588.92	583.92	13157280.0112	766562.2513
109A	8862	P	608.03	589.32	586.32	13156799.7733	765345.7939
	6170	O	609.52	584.97	581.97	13156824.9566	765359.4239
109B	8864	P	602.92	588.86	585.86	13157062.0634	764765.8163
	8863	O	600.50	590.39	587.39	13157081.0523	764774.8389
109D	8866	P	601.55	590.79	587.79	13157352.6629	764260.9715
	8865	O	600.51	589.88	586.88	13157366.5622	764261.3881

Top of Casing surveyed in 2014
[1] Top of Casing surveyed in 2010
[2] Top of Casing surveyed in 2013
[3] Top of Casing surveyed in 2015
O= Piezometer located outside of tile
P= Primary Piezometer located nearest tile
I= piezometer located inside of tile
D= Deep Piezometer

Table 6. Inspection Schedule for Environmental Monitoring Programs

Inspected Item	Frequency	Inspection Items
Monitoring Wells:	Inspect when sampled:	Intact (not bent or broken)
Glacial Till and Regional Aquifer	Quarterly/Semi-Annually for SLF Till Wells	No excessive silting
Poseyville Landfill	Quarterly/Annually	No pooling around base
Well 3795	Semi-annually	Secured/Labeled
Northeast Perimeter	Semi-annually	Pump operational (if present)
Ash Pond Area	Quarterly	
7th Street Purge Well Area	Quarterly	
Overlook Park (8915)	Semi-annually	
Salzburg Landfill Ground Water	Semi-annually	
Piezometers:	Inspect when measured:	Intact (not bent or broken)
Poseyville Landfill	Quarterly	No excessive silting
Facility Shallow	Semi-annually	No pooling around base
River Corrective Action (MW-8)	Quarterly	Secured/Labeled
SDF	Quarterly	
LEL I, II, and III	Quarterly	
1925 Landfill	Monthly (May-August) Quarterly (Jan.-April, Sept.-Dec.)	
Overlook Park	Monthly (tile piezos) / Semi-annually (till piezos)	
Automated Piezometer Data	Quarterly	Validation/calibration
Purge Wells:	Inspect when monitored:	Well intact
Wells 5964, PW-1, PW-2, PW-3, PW-4, LS -121	Twice per week	Pump operational Maintaining adequate purge rates
Salzburg Lift Stations (LDS and Leachate)	[illegible] LDS and annual for active leachate). Operations monitors lift stations daily through automated operational and level alarms.	Pump operational, cap on sump access is intact, lift staion is labeled.
Poseyville Landfill	Twice per week	Pump operational and is maintaing adeqaute flow rates

Table 6. Inspection Schedule for Environmental Monitoring Programs

Inspected Item	Frequency	Inspection Items
Collection Tile System: East-Side RGIS River Corrective Action (Sand Bar Lift Station) T-Pond RGIS 6-Pond Tile	Manual inspections are conducted on scheduled work day, excluding weekends and holidays. Environmental Operations monitors RGIS telemetry and alarm systems after hours and over the weekend.	Automated Piezometer Levels
		Automated Lift Station Levels
		Operational Alarms
		Automated River Levels
	Weekdays	Lights/Problems
		Lift Stations secure
		Piezometer/cleanout protective casings intact
	Semi-weekly	Lift Stations levels
		Catch basin observation
		Lift Station pump operation and flow rate
	Weekly (East-Side) Monthy (T-Pond) (when accessible)	No groundwater seepage on bank or around piezometers or cleanouts
		No distressed vegetation (indicating groundwater seepage)
		Cap integrity
		No visible piezometer/cleanout damage
	Annually (post-flooding)	Cap integrity

Table 7. 6-Pond Tile Piezometer Specification Table

Cluster	Piezo	Piezo Location	Elevation TOC*	Top of Screen	Bottom of Screen	Y coord	X coord
BD	8579	P	605.78	596.7	593.7	764225.0843	13157001.77
	8599	O	608.10	598.5	595.5	764313.1842	13157068.86
BE	8580	P	606.67	598.5	595.5	764241.6965	13155952.61
	4586	O	607.38	---	---	764285.199	13155955.26
BF	8578	P	607.13	600.3	597.3	764271.7182	13155344.72
	8598	O	609.05	601.5	598.5	764301.5773	13155352.64
R	3975	O	603.79	600.5	598.0	764157.26	13157425.29
	6194	P	605.19	596.1	593.1	764091.7591	13157340.17
	4787	I	605.55	596.4	593.4	764041.5014	13157291.23
S	3983	O	604.25	594.3	591.8	763690.6501	13157912.74
	6193	P	604.49	595.3	592.3	763636.8625	13157838.8
	3985A	I	606.12	596.2	593.7	763599.0797	13157765.58
	3985B	I	605.75	590.9	575.4	763598.0795	13157769.85
	3986A	I	608.55	593.7	591.2	763566.0396	13157735.89
	3986B	I	607.57	584.9	582.4	763563.0495	13157739.89
6 Pond Tile System [1]	CO A In	I	620.07	---	---	759206.5343	13157188.82
	CO A Out	O	620.04	---	---	759199.0342	13157188.83
	CO B In	I	611.48	---	---	759151.0987	13157559.43
	CO B Out	O	611.6	---	---	759140.2991	13157559.84
BG	8721	P	615.29	594.0	591.0	764139.738	13154983.74
	8722		614.91	603.3	600.3	764146.4147	13154964.39
BH	8723	P	609.89	595.7	592.7	763621.0881	13154935.47
	8724		609.35	604.6	601.6	763621.5638	13154915.12
BI	8725	P	609.72	597.9	594.7	763099.1512	13154939.49
	8726		609.66	604.0	601.0	763098.7872	13154927.84
BJ	8727	P	614.36	600.7	597.7	762352.6164	13154942.18
	8728		613.73	603.0	600.0	762353.2501	13154928.63
BK	8729	P	611.54	602.0	599.0	762353.2718	13154946.73
	8730		611.28	605.2	602.2	761960.0124	13154933.51

Top of Casing (TOC) Elevations surveyed 2014.

[1] Top of Casing (TOC) Elevations surveyed 2009.

O= Piezometer located outside of tile

P= Primary Piezometer located nearest tile

I= piezometer located inside of tile

Table 8. SAP Revision Table

Revision Date	Revision Number	Summary Description of Revision	Section	Approval Date
Mar-1994	AAMP	Elimination of the AAMP requirement for PM-10 monitoring. Discontinue of monitoring at sites 2, 6 and 7. Discontinue of reporting of data from two meteorological stations. Continuation of hydrogen chloride monitoring using a new method. Discontinue of monitoring of ethylbenzene, chloroethane and toluene. Continuation of monitoring of metals and carcinogenic VOCs (i.e. Acrylonitrile, Benzene, 1,3-Butadiene, Carbon Tetrachloride, Chloroform, Ethylene Dichloride, Methyl Chloride, Methylene Chloride, Styrene, Tetrachloroethylene and Vinyl Chloride (New)).		
Oct-1994	AAMP	Elimination of hydrogen chloride as a monitoring parameter for AAMP		
Nov-1994	AAMP	Original AAMP created and approved		
Sep-2000	AAMP	Reduction in the frequency of monitoring for metals for AAMP. Changed from every six days to every twelve days.		
Sep-2002	AAMP	Approval of the AAMP for Dow's Midland Manufacturing Site, Revision 4, dated May 31, 2002, as revised by the July 8, 2002 submittal. This included relocation of the upwind monitoring site (Site 4).		
Dec-2002	1	Original, submitted with Environmental Monitoring Report in the License Application		Jul-2003
Apr-2005	2	Annual Revision - Added Additional Monitoring from Compliance Schedule Activities, and updated detection limits		Sep-2005
Apr-2006	3	Annual Revision - Aligned format with SLF SAP to be submitted in 2006; added NE Perimeter, CD-3, Greenbelt Soil Monitoring, etc.		
Sep-2006	3A	Changes per DEQ comment; (See list attached to final submittal letter, dated October 26, 2006)		
Aug-2007	3B	Changes per DEQ comment; (See list attached to final submittal letter, dated August 17, 2007)		
Oct-2007	4	Annual Revision -		
Apr-2008	4A	Added 6178 and 6175 Areas, updated soil boxes		Oct-2008
Jan-2010	5	Annual Revision - aligned format with SLF SAP; added field data sheet and well inspection sheet as appendices; updated target lists and reduced monitoring frequencies where appropriate (for complete list see table attached to submittal letter, dated January 4, 2010).		

Table 8. SAP Revision Table

Revision Date	Revision Number	Summary Description of Revision	Section	Approval Date
Jul-2010	AAMP	Metals analysis was discontinued for AAMP.		
Dec-2011	6	Includes proposed revisions from Rev. 5 that were deemed acceptable by MDEQ, along with additional revisions that have been discussed in subsequent meetings (for complete list see table attached to submittal letter, dated December 9, 2011).		
Sep-2012	6A	Includes proposed revisions from Rev. 6 that were deemed acceptable by MDEQ, along with additional revisions that have been discussed in subsequent meetings.		
Feb-2013	6B	revisions based on technical review with MDEQ		May-2013

Table 8. SAP Revision Table

Revision Date	Revision Number	Summary Description of Revision	Section	Approval Date
Mar-2015	7	Minor Updates - added LS 109 to RGIS West, removed background development from NEP, updated figures, typos, and format		
Aug-2015	AAMP	Per the Criteria for Revising, removed 1,3-butadiene, chloroform, methylene chloride, styrene, tetrachloroethylene, toluene and vinyl chloride. Added 1,2-dibromoethane, 1,1,1,2-tetrachloroethane, 1,1,2-trichloroethane and trichloroethylene as monitoring parameters for AAMP.		
Sep-2015	7	Updated license condition references; added performance criteria for PLF Corrective Action wells		
Feb-2016	7	Amendment to updated piezometers in RGISE and Facility Shallow		
Aug-16	8	Added Salzburg Landfill Regional Aquifer and Glacial Till Wells to GTRA Program		
Aug-16	8	Added Salzburg Landfill Soil Boxes to a single program		
Aug-16	8	Added new 52-Gate and SLF-04 Soil Boxes to program		
Aug-16	8	Added Salzburg Landfill Leachate Monitoring		
Aug-16	8	Added Salzburg Landfill Leak Detection System Monitoring		
Aug-16	8	Removed Primary Inorganics From Salzburg Landfill Target List		
Aug-16	8	Removed obsolete wells from LEL I hydraulic program so they can be properly abandoned		
Aug-16	8	Added Ambient Air Monitoring Program from Midland Plant and Salzburg Landfill		
Aug-16	8	Updated RGIS Piezometer table to include 2015 Upgrade Project		
Aug-16	8	Added Overlook Park Monitoring Program		
Aug-16	8	Updated RGIS Inspection Schedule to allow for remote inspection during weekends, with visual inspection on weekdays		
Feb-19	8A	Changed wording to include the possibility for electronic data collection application and use	2.2 (extending throughout SAP)	
Feb-19	8A	Changed the use of hot water to tap water for decontamination procedure	2.3.1 & 2.3.2	
Feb-19	8A	Defined "chemical impact"	2.4	
Feb-19	8A	Added language about lab preservation verification	2.5	
Feb-19	8A	Defined length of time that water shall flow through .45 um filter before filling sample bottles	2.6	
Feb-19	8A	Verbiage added regarding reporting additional sampling to the Office of Waste Management and Radiological Protection	2.11	
Feb-19	8A	Removal of paragraph describing reporting timeline and what is to be included in each report.	2.11	

Table 8. SAP Revision Table

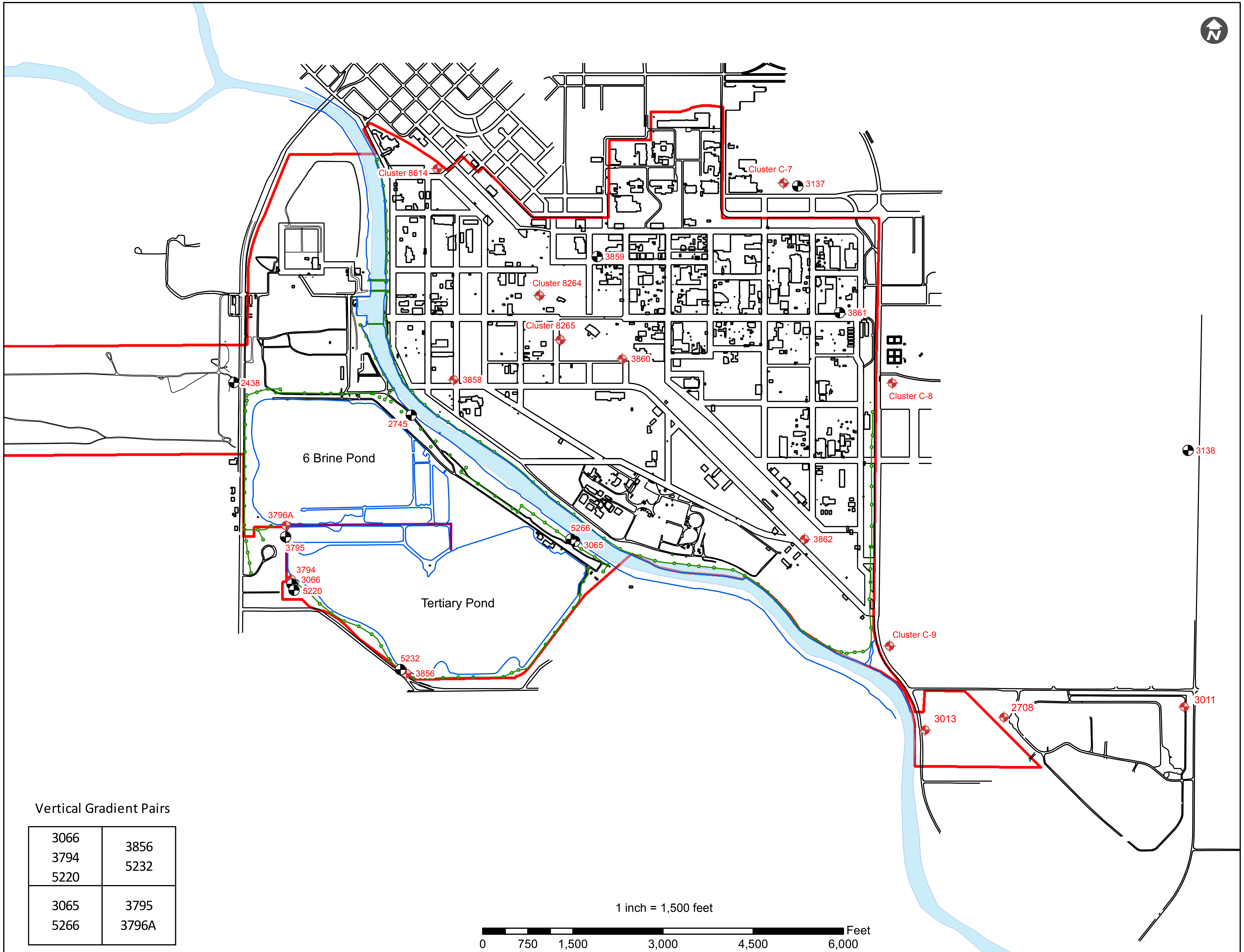
Revision Date	Revision Number	Summary Description of Revision	Section	Approval Date
Feb-19	8A	Added language regarding well security	3.1	
Feb-19	8A	Inserted language delineating how static water level meters are designated clean, dirty, intermediate	3.1.2	
Feb-19	8A	Clarified decontamination procedure for static water level meters by stating decontamination of the stainless steel indicator probe is necessary	3.1.2	
Feb-19	8A	Replaced "could" with "is" in regards to measuring depth to water	3.1.2	
Feb-19	8A	Clarified well purging language to accommodate automatically cycling pumps.	3.3.1.4	
Feb-19	8A	Changed "purge to dryness" to "unless purging results in dryness"	3.3.1.5	
Feb-19	8A	Clarified that filtering would be reserved for dissolved metals analyses	3.4	
Feb-19	8A	Removed phrase "in the laboratory"	5.1.2	
Feb-19	8A	Removed incremental soil sampling	5.1.3	
Feb-19	8A	Removed "annual" from this section	6.5	
Feb-19	8A	Added stipulation into Flow Rate Screening Criteria upper tolerance limit	7.5	
Feb-19	8A	Removed trigger levels for compounds in table and added them to Appendix J	8.4	
Feb-19	8A	Changed REDOX to ORP	All Tables	
Feb-19	8A	Added wells 2708, 3011, and 3013 and SLF clay wells to GTRA detection monitoring table	2A	
Feb-19	8A	Added paragraphs delineating semiannual evaluation	2A	
Feb-19	8A	Performance Criteria added to Appendix J	2A	
Feb-19	8A	Language clarification regarding metals' UPLs	2A	
Feb-19	8A	Removed LS 13 from East Side RGIS Chemical Monitoring	2B	
Feb-19	8A	Removed Field parameters from East Side RGIS Chemical Monitoring	2B	
Feb-19	8A	Replaced 6002 (Cluster AS) with 9010 (Cluster 102A) & 6004 (Cluster AS) with 9012 (cluster 102A)	2B	
Feb-19	8A	Added in information about 2-Day and Quarterly Evaluations as pertains to East Side RGIS Hydraulic Monitoring	2B	
Feb-19	8A	Removed field parameters from West Side RGIS Chemical Monitoring	2C	
Feb-19	8A	Removed field parameters from LS 11 Chemical Monitoring	2D	
Feb-19	8A	Removed field parameters from River Corrective Action Chemical Monitoring	2E	
Feb-19	8A	Removed MW-8 and replaced with well 5678	2E	

Table 8. SAP Revision Table

Revision Date	Revision Number	Summary Description of Revision	Section	Approval Date
Feb-19	8A	Replaced "Upper River Level" with "Lower River Level" in regards to comparison of the 5678 hydraulic monitoring program	2E	
Feb-19	8A	Clarified which conditions were being referenced	2F	
Feb-19	8A	Removed many VOAs and added EOAs and metals to constituent list	2G	
Feb-19	8A	Added post-remedy evaluation section	2G	
Feb-19	8A	Added semi-annual evaluation section to Northeast Perimeter Compliance Monitoring	2I	
Feb-19	8A	Changed Facility Shallow Hydraulic Monitoring from quarterly to semi-annual evaluation	2K	
Feb-19	8A	Removed wells 2790, 2964, and 3081 from Facility Shallow Hydraulic Monitoring program	2K	
Feb-19	8A	Changed confirmation sampling strategy from collecting 4 replicate samples to collecting one confirmation sample.	All applicable programs	
Feb-19	8A	Updated table to include SLF lift stations and monitoring wells	Table 7	
Feb-19	8A	Removed well 3337 from Facility Shallow because it will be removed during construction activities. Added in Well 9059	2-K	
Feb-19	8A	Updated UPLs for select monitoring locations in Salzburg Surface Water, Ash Pond, T-Pond, and Poseyville Landfill	Appendix J	
Feb-19	8A	Removed DRO, carbonate compounds and chloride from 7SPW analyte list	Table 2-F and Appendix J	
Feb-19	8A	Removed PWs 5, 6, and 7 from 7SPW monitoring program and added LS 121 to the chemical monitoring program.	2-F	
Feb-19	8A	MW-18 in 7SPWCA is being addressed under Corrective Action activities and this was captured in Table 2 and Appendix J	Table 2-F and Appendix J	
Feb-19	8A	Compounds were removed from 7SPWCA analyte list. The compounds removed were artifacts from a previous investigation performed in this area did not contribute to monitoring program.	Table 2-F and Appendix J	
Feb-19	8A	Map were updated to reflect all changes applicable changes for the 8A SAP Revision.	Maps	
Feb-19	8A	Frequency of soil monitoring at Salzburg was increased to align with Midland Plant evaluation plan. Criteria for Salzburg was also lowered to reflect the change in frequency.	Table 2 and Appendix J	
Feb-19	8A	LEL 1 program - stormwater detention pond wells were removed. The two year timeline dictating the schedule for these wells was complete in December of 2018. Data did not indicate any increase in water levels in the detention basin wells in response stormwater.	Table 2-O	
Feb-19	8A	Added EMIS language to reporting section of SAP text.	Section 2.1.1	
Feb-19	8A	Replaced NEP and Facility Shallow well 4364 with well 9317	2-I	

Table 8. SAP Revision Table

Revision Date	Revision Number	Summary Description of Revision	Section	Approval Date
Feb-19	8A	SSRT LS -S9 will be chemically monitored every five years starting in 2019 for Appendix IX compounds to align with RGIS requirements. A separate compound list will be developed based on the detected compounds.	2-L	
Feb-19	8A	The LDS evaluation now states: An evaluation of tracking parameter result versus UPLs (if applicable) will be performed and the results will be reported in each quarterly monitoring report with a summary of trends provided in the annual report. Metal detections less than 5X the UPL will not require confirmation sampling or notifications if no organic compounds are detected. If a metal is detected 5X the UPL confirmation sampling and notifications per the License requirements will be implemented.	2-Y	
Feb-19	8A	Dow Coordinates in Tables 4 and 5 were replaced with NAV83 Lat./Long coordinates. Top of Casing data was also updated Salzburg Landfill Groundwater Wells.	Table 4 and Table 5	
Feb-19	8A	AAMP program was updated. The compounds list for VOC was revised. Appendix L includes both Midland Plant and Salzburg. AAMP performance criteria were added Appendix J.	Table 2-W, Appendix J and Appendix L	
Feb-19	8A	Changed RGIS Manual inspections from daily, seven days per week, to Monday through Friday. Environmental Operations monitors the RGIS telemetry and alarm systems after hours and over the weekend. Response plans and procedures are in place to provide response to unexpected conditions.	Table 6	
Sep-19	8A	from the GTRA groundwater monitoring program. Salzburg Landfill's groundwater monitoring program utilizes the same wells and analyte lists as its original program with the exception of GTRA wells located within Salzburg Landfill, which have moved to the GTRA program and have adopted GTRA analyte list and	SAP Text and Table 2-A and 2-AA	
Sep-19	8A	The confirmation sampling for detection monitoring programs was reduced from sampling in quadruplicate to sampling in duplicate.	Table 2-A, 2-H, 2-M, 2-N, 2-Y, 2-AA	
Sep-19	8A	For Salzburg Landfill leak detection monitoring the notification and confirmation sampling requirements were changed for tracking parameters, if only a single tracking parameter is detected above its performance criteria but less than 10 times its performance criteria and no primary parameters are detected, then confirmation sampling per the License is not required.	Table 2-Y	
Sep-19	8A	SAP text was updated to include how and when purging should occur at lift stations and purge wells. Additional updates to text include making filtering procedures more clear as well low-flow sampling parameters.	SAP Text	
Jan-19	8A	Table 2B was updated to capture that Cluster AQ was replaced with Cluster 3B. The new primary piezometer was also updated with 9113 for cluster 3B. Cluster 3B also replaced Cluster AQ on Figure 2.	Table 2B and Figure 2	



Vertical Gradient Pairs

3066 3794 5220	3856 5232
3065 5266	3795 3796A

Figure 1
Glacial Till and Regional Aquifer Detection & Hydraulic Monitoring Wells Site Plan

AECOM
MICHIGAN - DOW BUSINESS UNIT
25 BUILDING
MIDLAND, MI 48667
(989) 636-0151

Legend

- Piezometers
- Groundwater Monitoring Wells
- Tpond Slurry Wall
- Facility Boundary
- Tittabawassee River
- Ponds

FILE NAME:
Map_of PlantGTRA rev 2019.mxd
UPDATED: 7/23/2019
JSAJ

AECOM

Dow Program

Figure B.1

Revetment Groundwater Interception System

Piezometer Cluster Location Plan East Side

The Dow Chemical Company

Michigan Operations

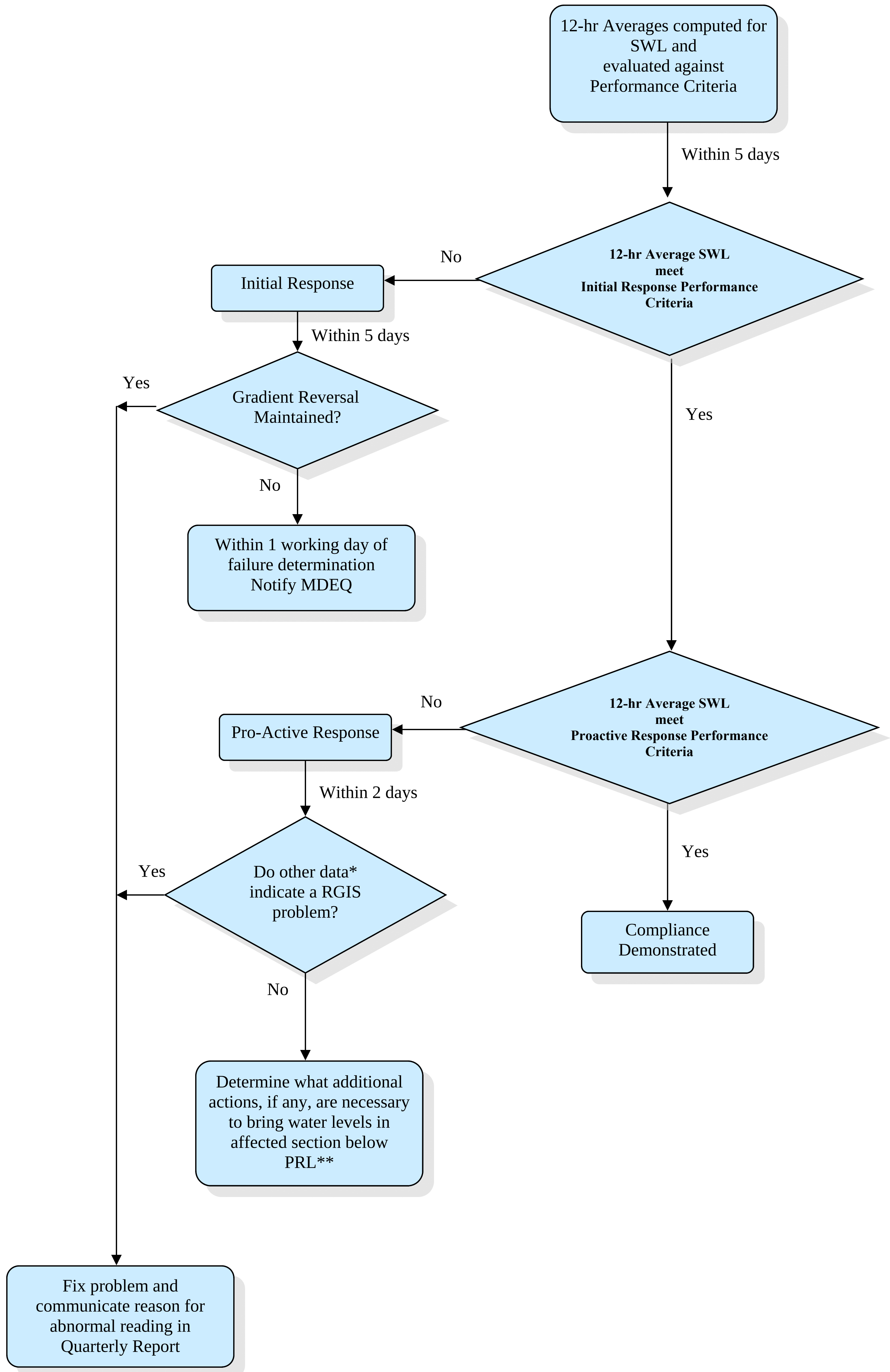
Drawn: JRS	Approximate Scale: As Shown
Date: 9 January 2020	Drawing File: RGIS Drawing Figure 2-rev

AECOM
Dow Business Unit

Figure 3
Revetment Groundwater Interception System
Piezometer Cluster Location &
6 Pond Tile Plan West Side
The Dow Chemical Company
Michigan Operations

Drawn: JLH	Approximate Scale: As Shown
Date: 1 December 2015	Drawing File: Main pond 2015Contours.mxd

Figure 4
Flowsheet for East Side RGIS
Hydraulic Data Evaluation and Reporting

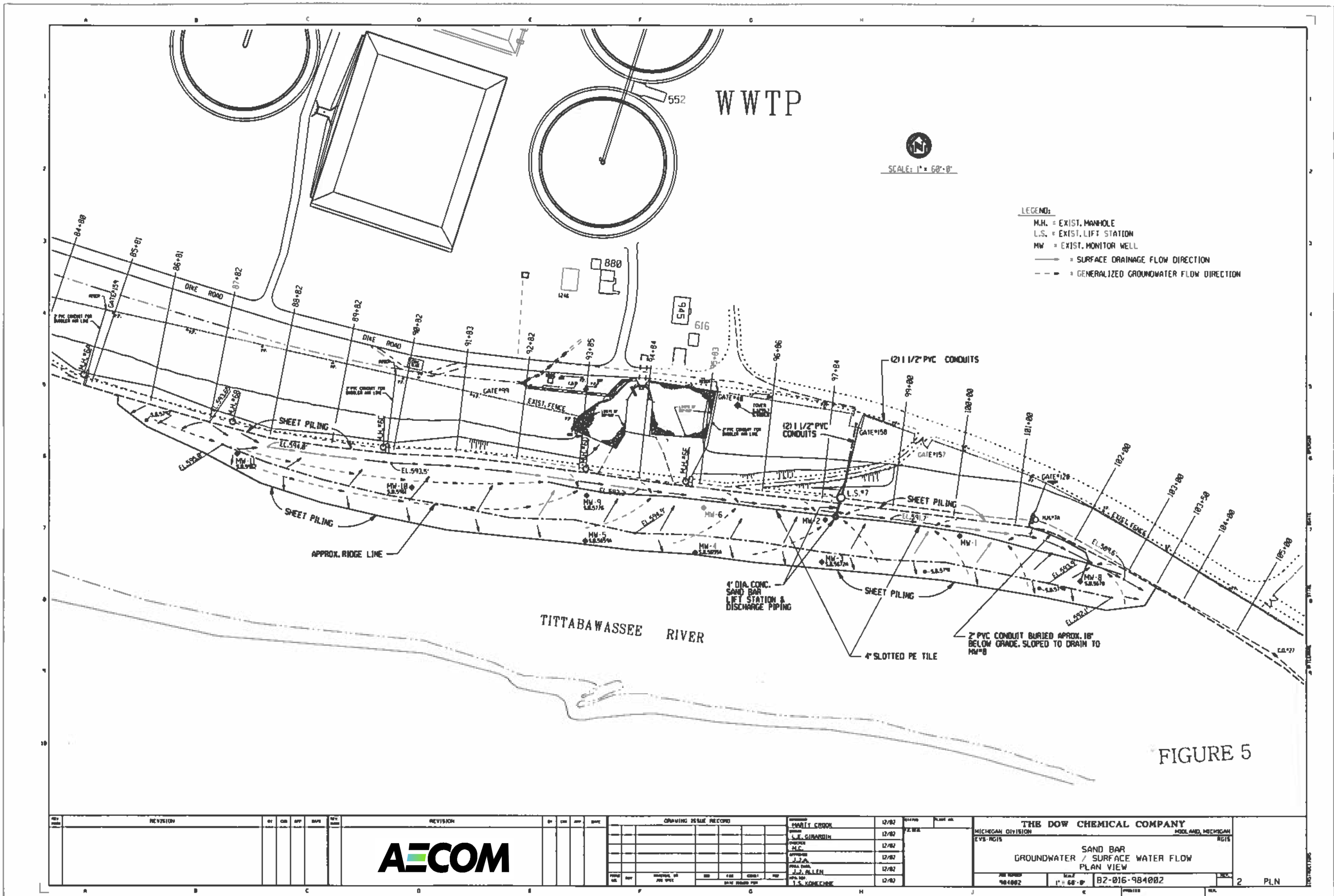


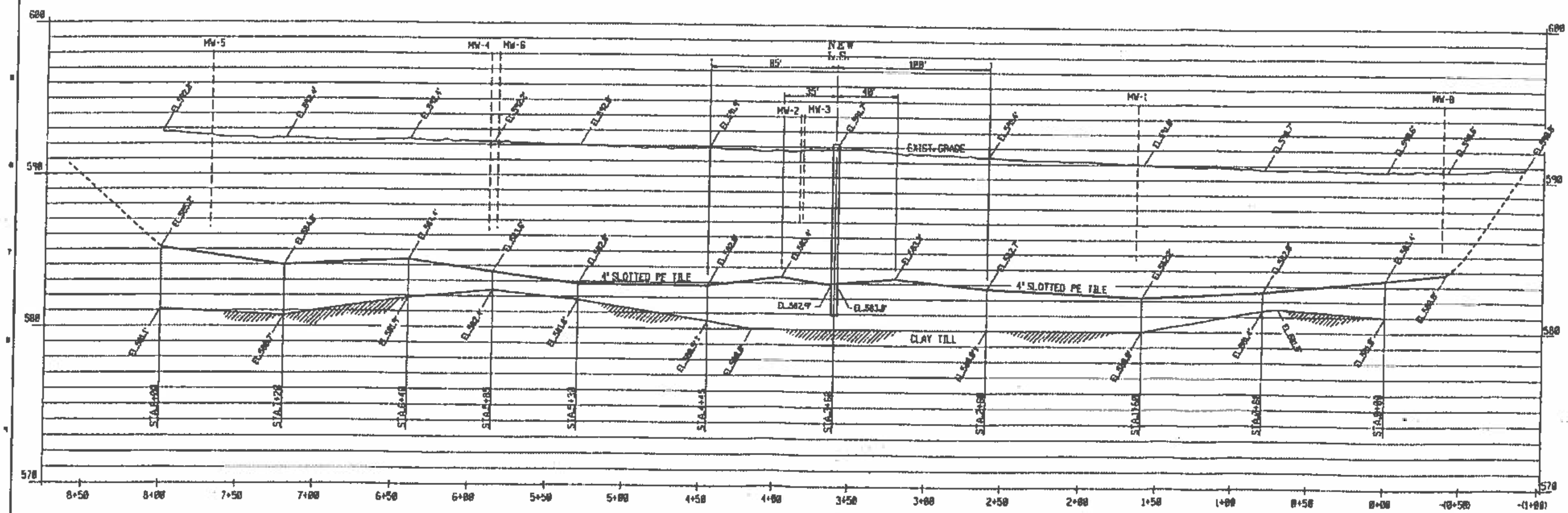
NOTES:
RGIS = Revetment Groundwater Interception System
SWL = Static Water Level
Performance Criteria area established in Table 2-B
PRL = Pro-Active Response Level (defined as: in Table 2-B Proactive Response Performance Criteria)

*may include:

- An on-line check of adjacent SWLs,;
- Monitoring of trends, including lift station levels and flow rates;
- Visual observation of affected area; and
- Manual SWL readings from piezometers, cleanouts, and/or manholes.

**If a planned response to repair or replace a section of RGIS is necessary, it will be submitted to the Division Chief for review and approval. The submittal will include a timetable which will summarize the time required to complete the repairs.


WWTP
552
880
945
616
SCALE: 1" = 60'-0"
LEGEND:
M.H. = EXIST. MANHOLE
L.S. = EXIST. LIFT STATION
MW = EXIST. MONITOR WELL
= SURFACE DRAINAGE FLOW DIRECTION
= GENERALIZED GROUNDWATER FLOW DIRECTION
DIKE ROAD
EXIST. FENCE
SHEET PILING
APPROX. RIDGE LINE
(2) 1 1/2" PVC CONDUITS
4" DIA. CONC. SAND BAR LIFT STATION & DISCHARGE PIPING
4" SLOTTED PE TILE
2" PVC CONDUIT BURIED APROX. 18" BELOW GRADE, SLOPED TO DRAIN TO MW#8
MW-1
MW-2
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9
MW-10
MW-11
L.S. #7
GATE #99
GATE #157
GATE #158
TITTABAWASSEE RIVER
FIGURE 5
AECOM
THE DOW CHEMICAL COMPANY
MICHIGAN DIVISION
MIDLAND, MICHIGAN
SAND BAR
GROUNDWATER / SURFACE WATER FLOW
PLAN VIEW
1" = 60'-0"
B2-016-984002
2
PLN



SAND BAR TILE
AS-BUILT ELEVATIONS

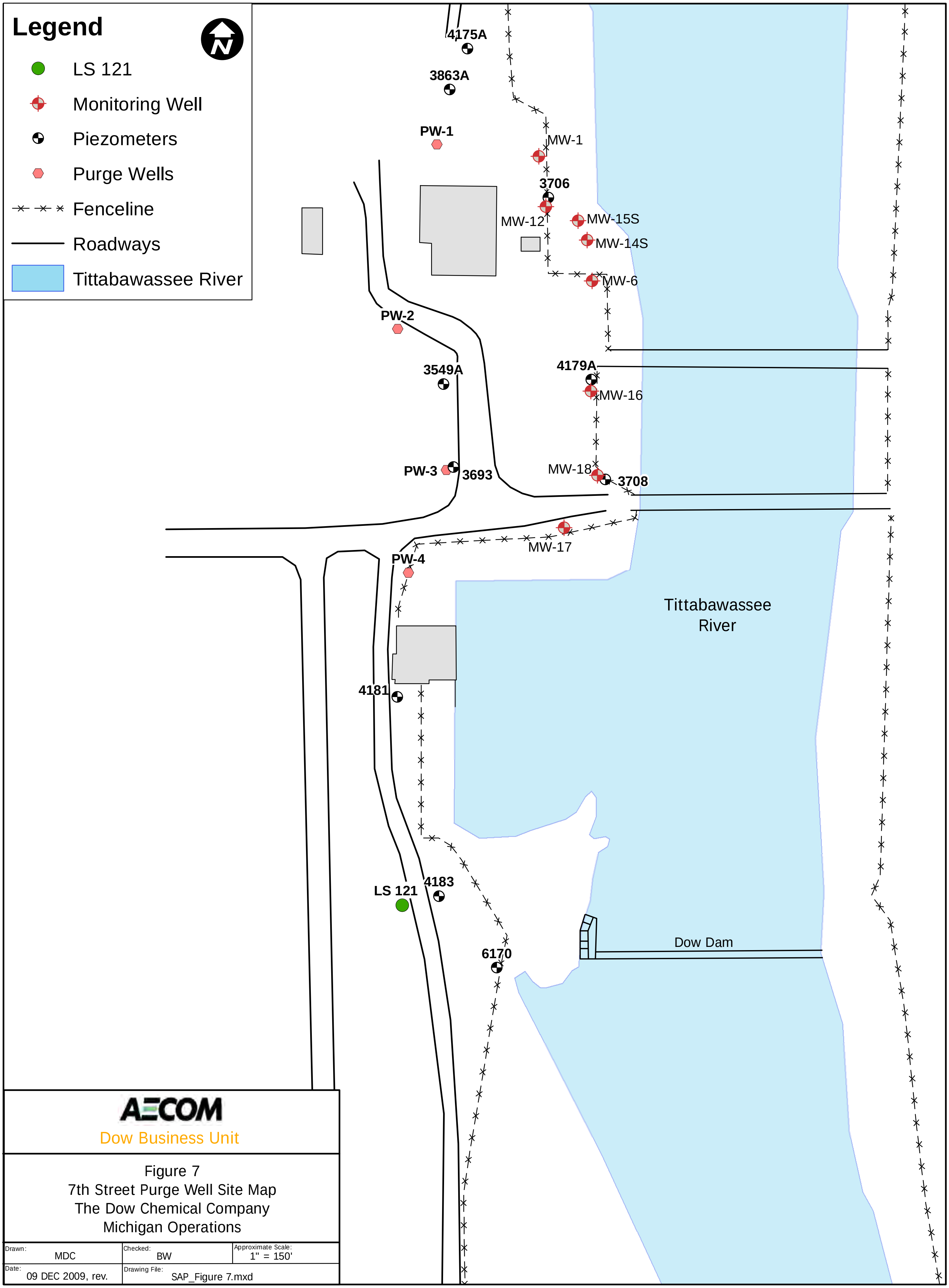
SCALE: HORIZ. 1" = 30'-0" VERT. 1" = 3'-0"

FIGURE 6

THE DOW CHEMICAL COMPANY
MICHIGAN DIVISION MIDLAND, MICHIGAN

SAND BAR SHEET PILING PROJECT
TILE PROFILE AS-BUILT

02-015-984802

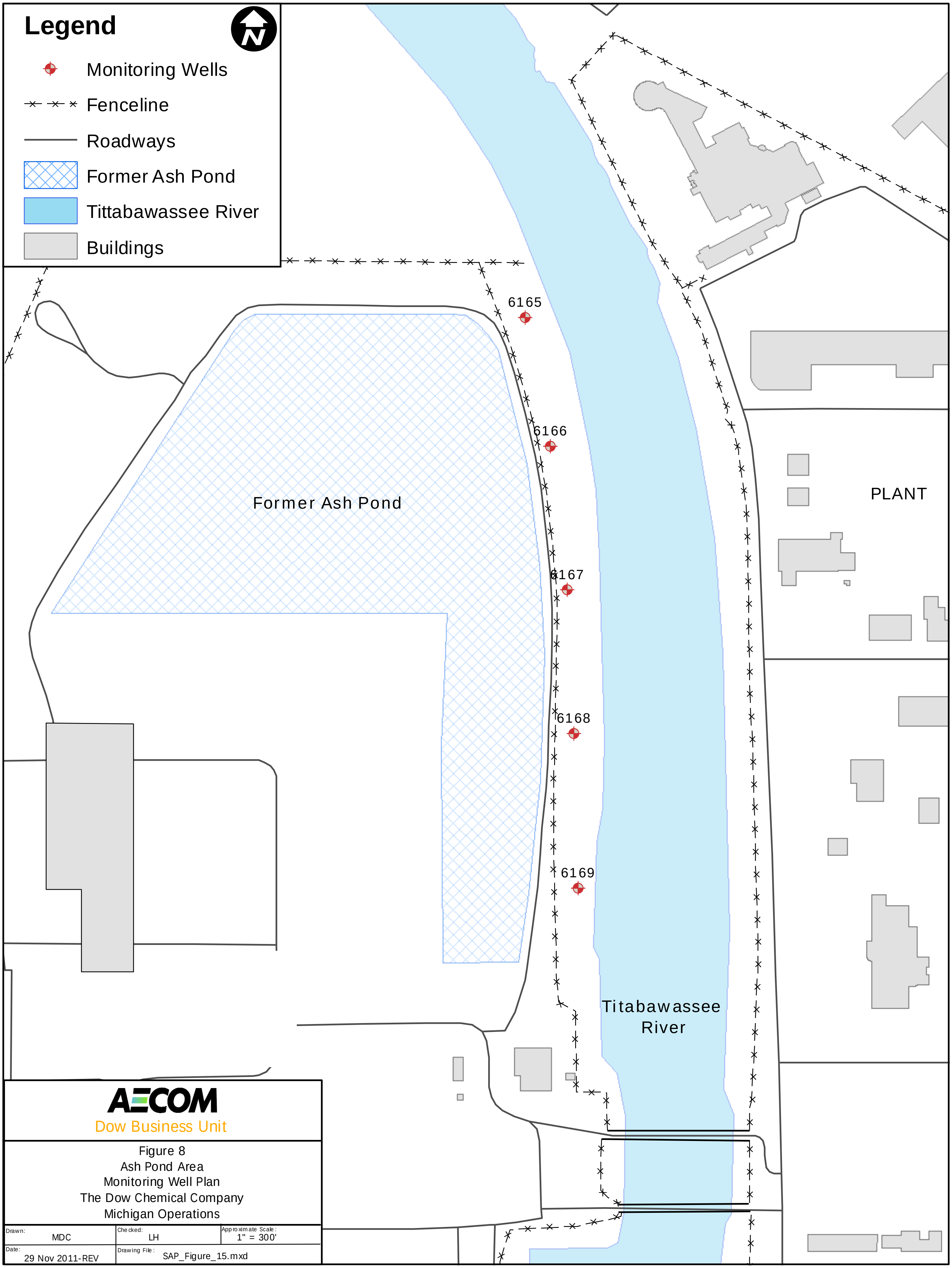


AECOM

Dow Business Unit

Figure 7
7th Street Purge Well Site Map
The Dow Chemical Company
Michigan Operations

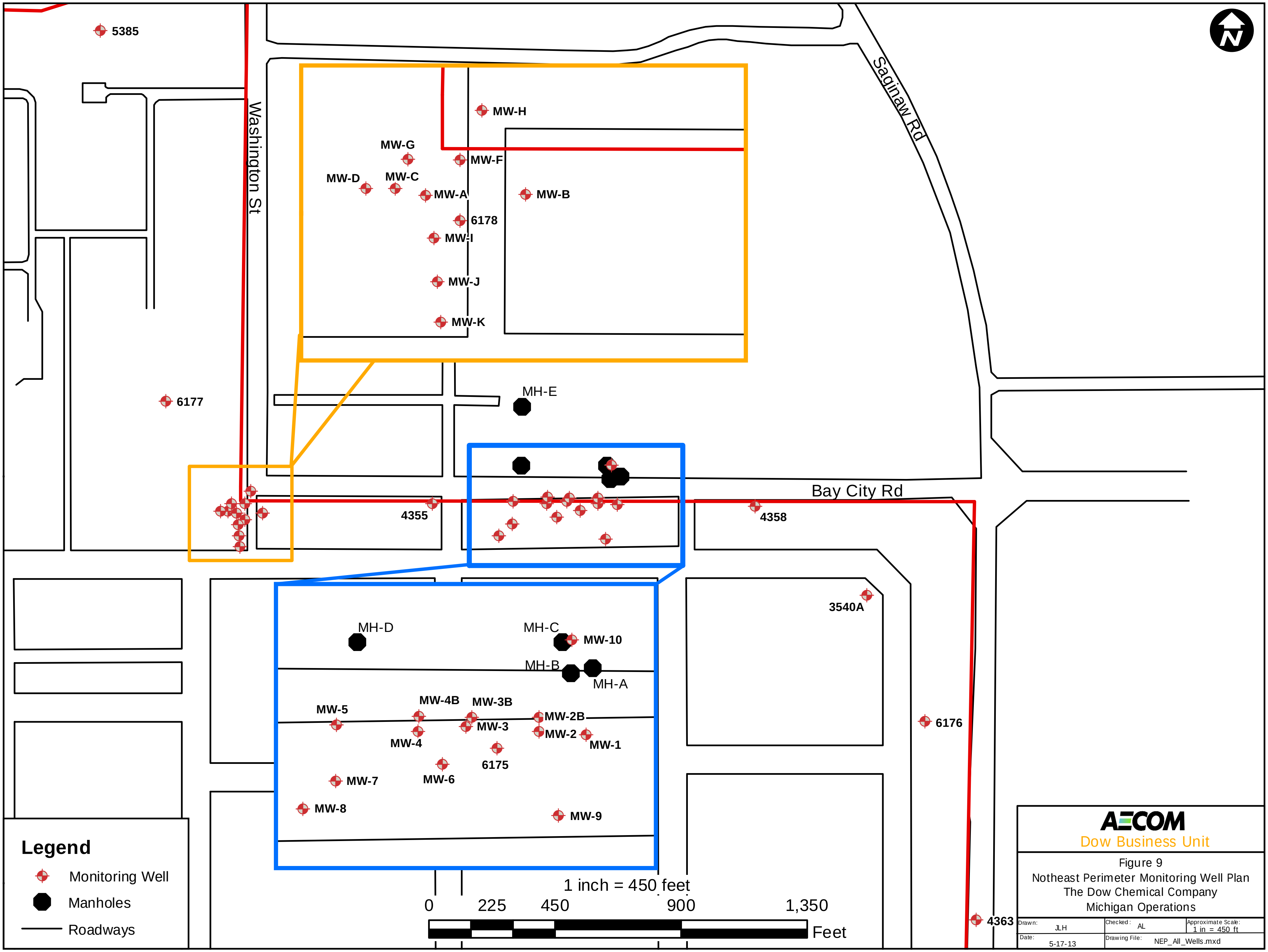
Drawn: MDC	Checked: BW	Approximate Scale: 1" = 150'
Date: 09 DEC 2009, rev.	Drawing File: SAP_Figure 7.mxd	

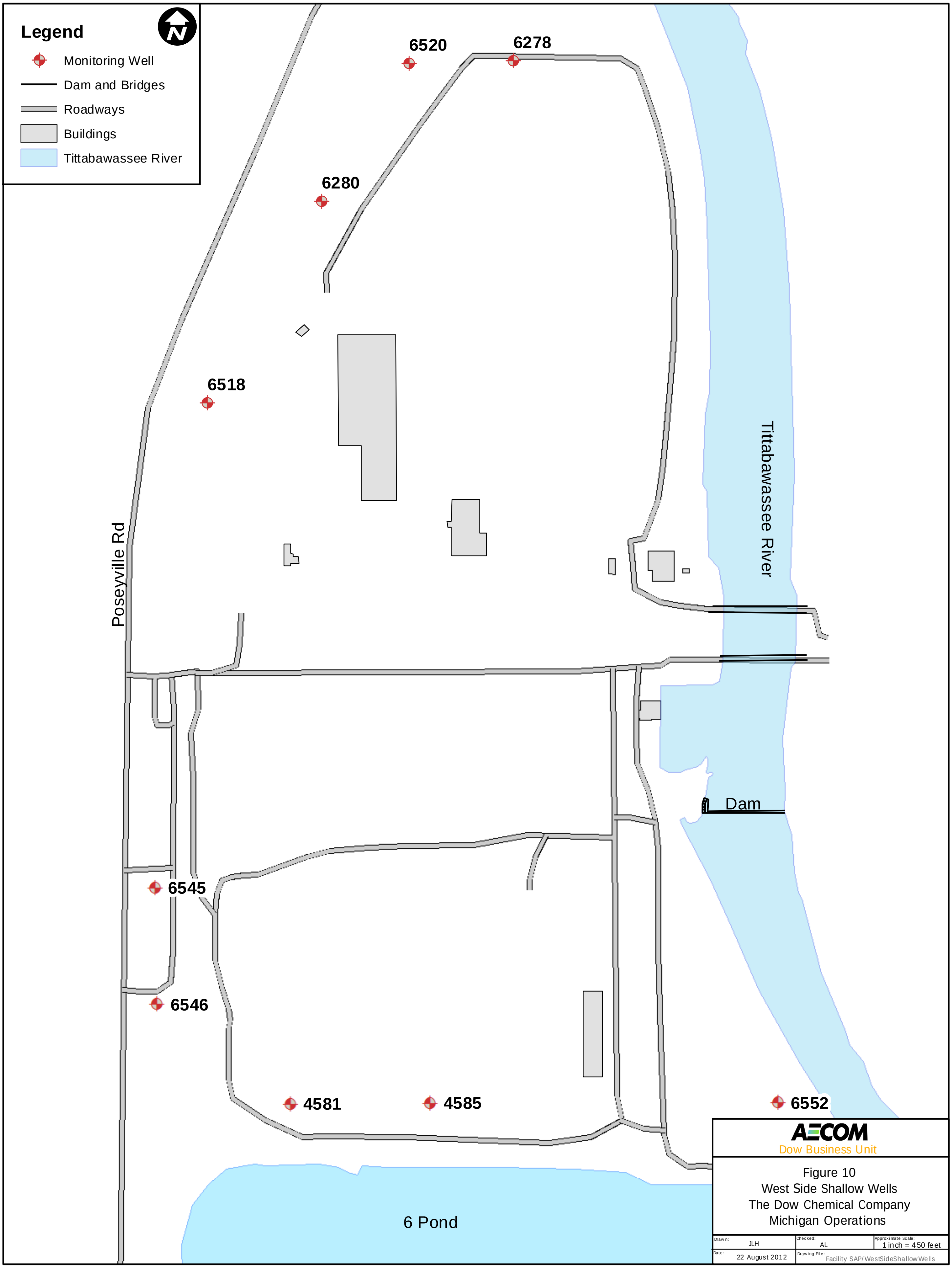


AECOM
Dow Business Unit

Figure 8
Ash Pond Area
Monitoring Well Plan
The Dow Chemical Company
Michigan Operations

Drawn: MDC	Checked: LH	Approximate Scale: 1" = 300'
Date: 29 Nov 2011-REV	Drawing File: SAP_Figure_15.mxd	

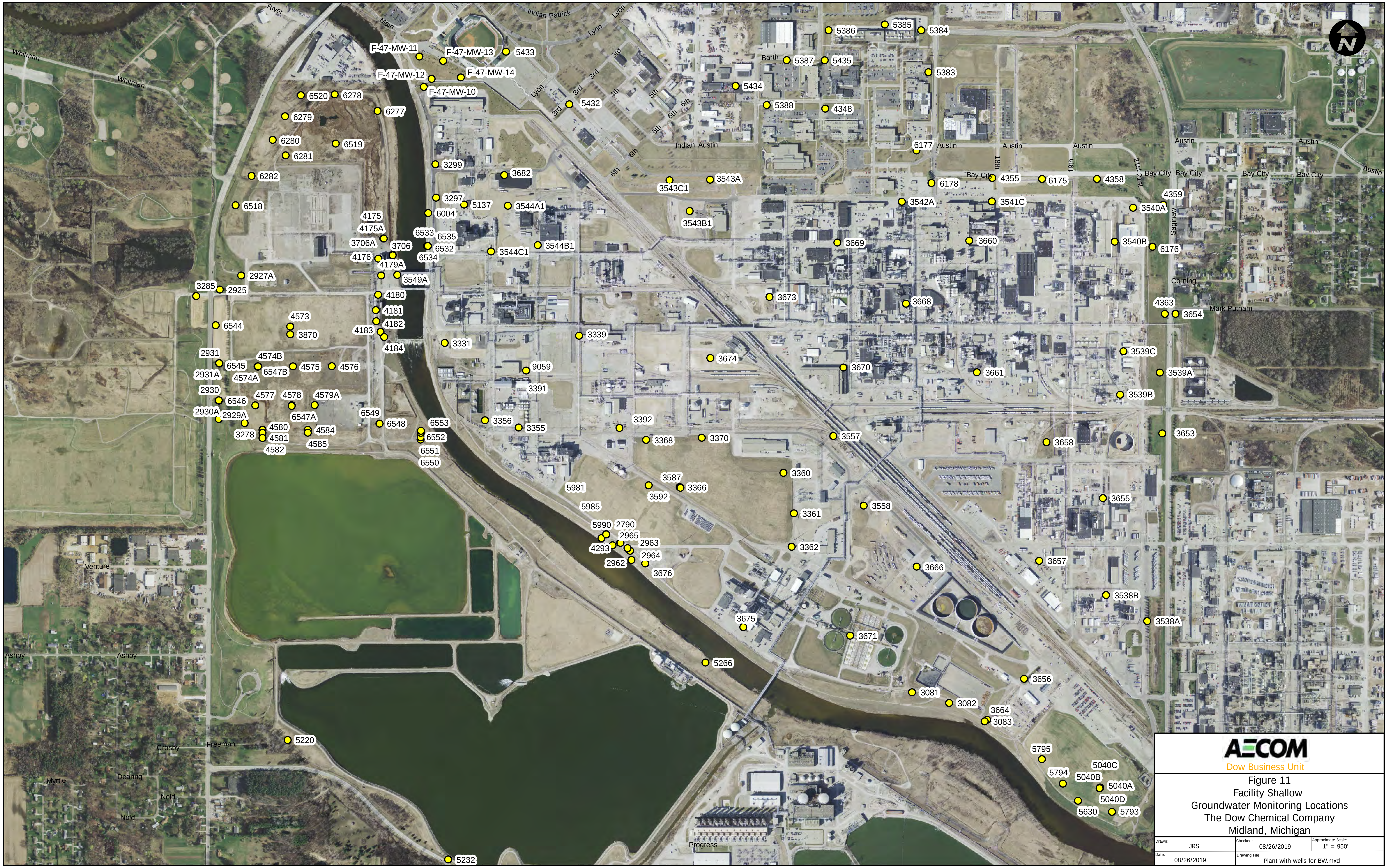

5385
Washington St
Saginaw Rd
MW-H
MW-G
MW-F
MW-D
MW-C
MW-A
MW-B
6178
MW-I
MW-J
MW-K
6177
MH-E
Bay City Rd
4355
4358
3540A
MH-D
MH-C
MW-10
MH-B
MH-A
MW-5
MW-4B
MW-3B
MW-2B
MW-3
MW-2
MW-1
MW-4
6175
MW-6
MW-7
MW-8
MW-9
6176
4363
Legend
Monitoring Well
Manholes
Roadways
1 inch = 450 feet
0
225
450
900
1,350
Feet
AECOM
Dow Business Unit
Figure 9
Northeast Perimeter Monitoring Well Plan
The Dow Chemical Company
Michigan Operations
Drawn: JLH
Checked: AL
Approximate Scale: 1 in = 450 ft
Date: 5-17-13
Drawing File: NEP_All_Wells.mxd



AECOM
Dow Business Unit

Figure 10
West Side Shallow Wells
The Dow Chemical Company
Michigan Operations

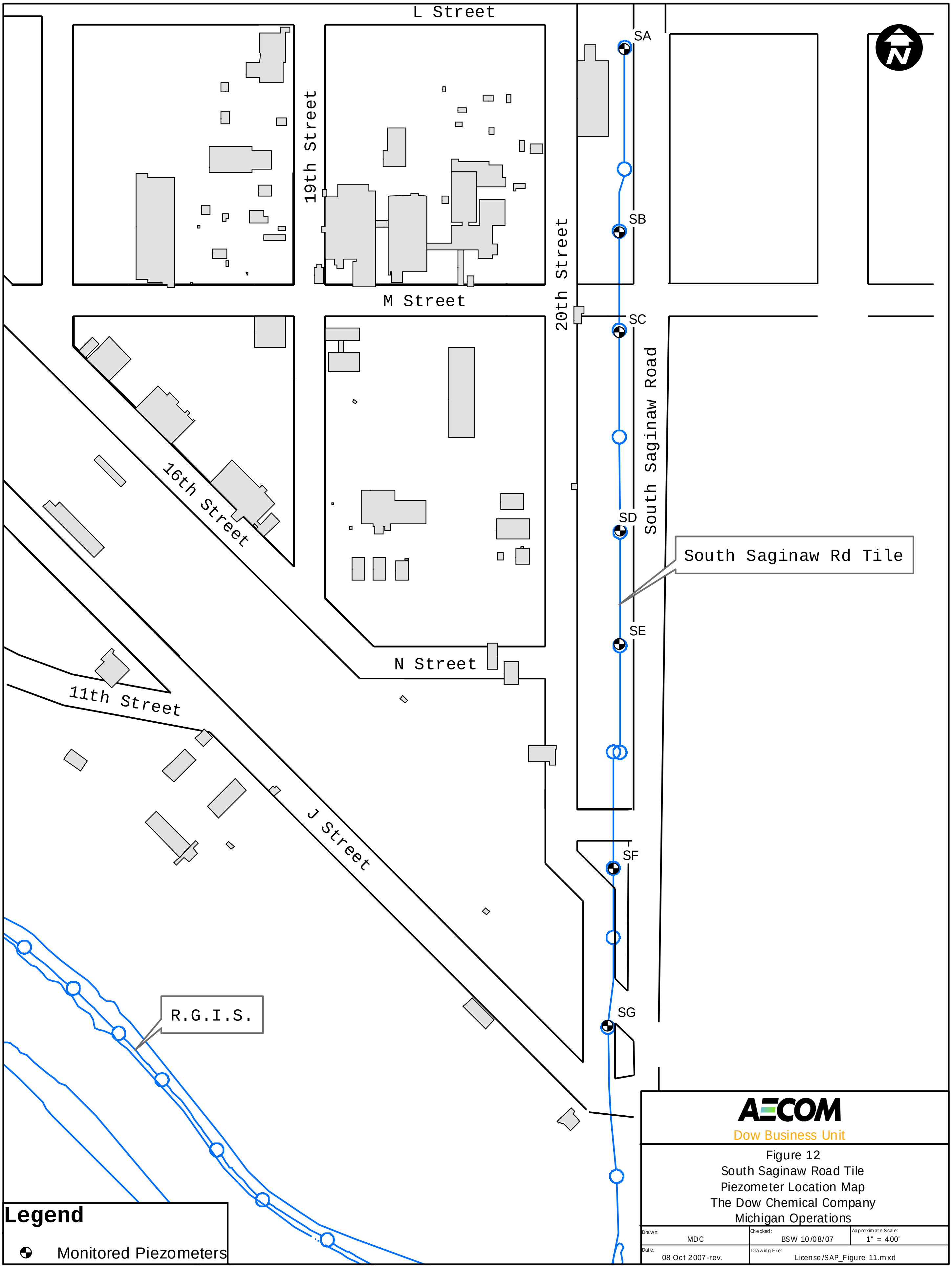
Drawn: JLH | Checked: AL | Approximate Scale: 1 inch = 450 feet
Date: 22 August 2012 | Drawing File: Facility SAP/WestSideShallowWells



AECOM
Dow Business Unit

Figure 11
Facility Shallow
Groundwater Monitoring Locations
The Dow Chemical Company
Midland, Michigan

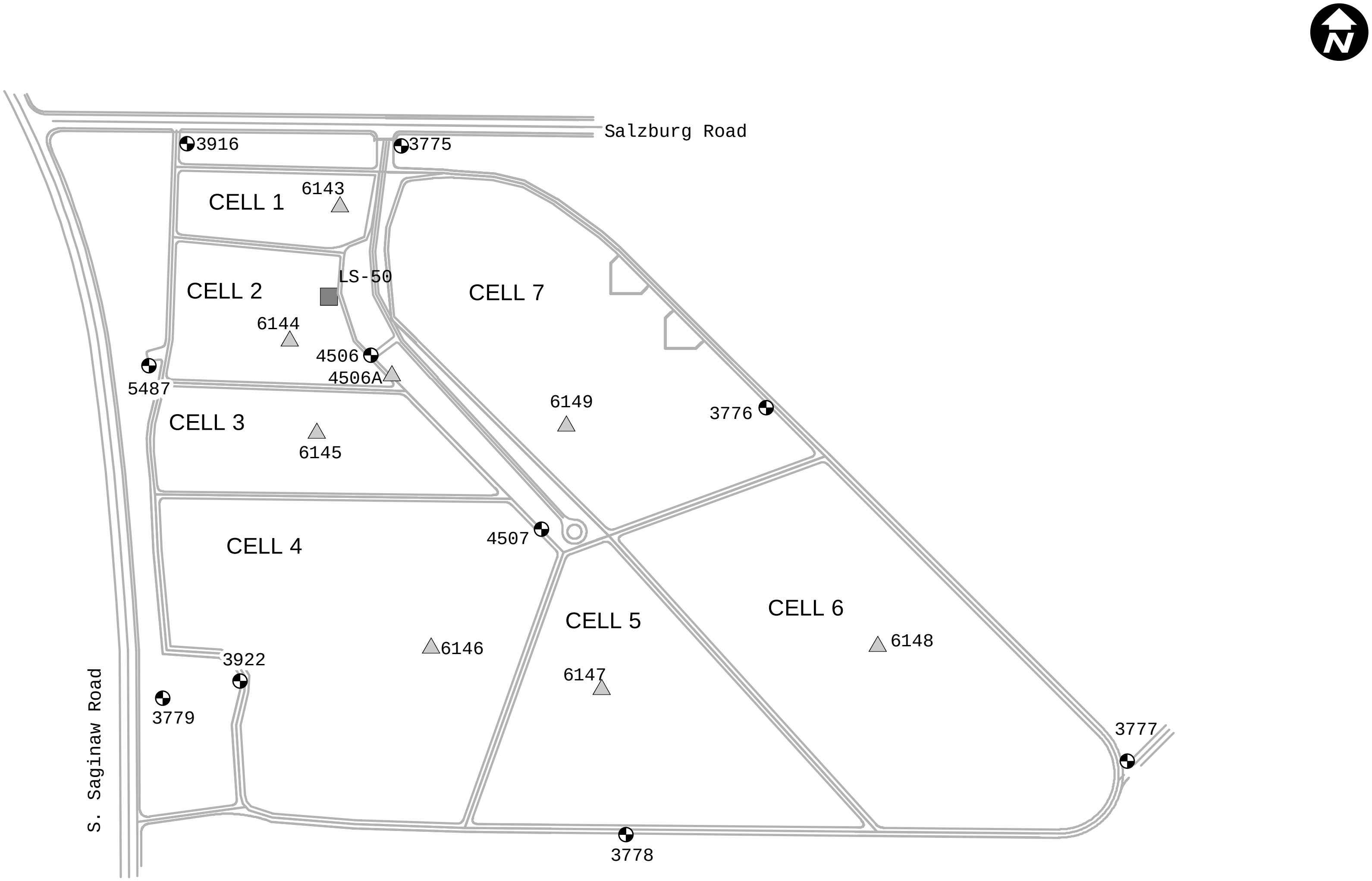
Drawn:	Checked:	Approximate Scale:
JRS	08/26/2019	1" = 950'
Date: 08/26/2019	Drawing File: Plant with wells for BW.mxd	



AECOM
Dow Business Unit

Figure 12
South Saginaw Road Tile
Piezometer Location Map
The Dow Chemical Company
Michigan Operations

Drawn:	Checked:	Approximate Scale:
MDC	BSW 10/08/07	1" = 400'
Date: 08 Oct 2007-rev.	Drawing File: License/SAP_Figure 11.mxd	



Legend

Well Type

- Monitoring Well
- Piezometer
- SDF Lift Station

AECOM

Dow Business Unit

Figure 13
Monitoring Wells and Piezometers
Sludge Dewatering Facility
The Dow Chemical Company
Michigan Operations

Drawn: MDC	Checked: BSW 10/08/07	Approximate Scale: 1" = 300'
Date: 08 Oct 2007-rev	Drawing File: SAP_Figure_3.mxd	

AECOM

Dow Business Unit

Figure 14
Site Location Plan
Poseyville Landfill
The Dow Chemical Company
Midland, Michigan

Drawn: MDC	Checked: 9/30/2010	Approximate Scale: 1" = 400'
Date: 29 September 2010	Drawing File: Poseyville Landfill Monitoring Points.mxd	

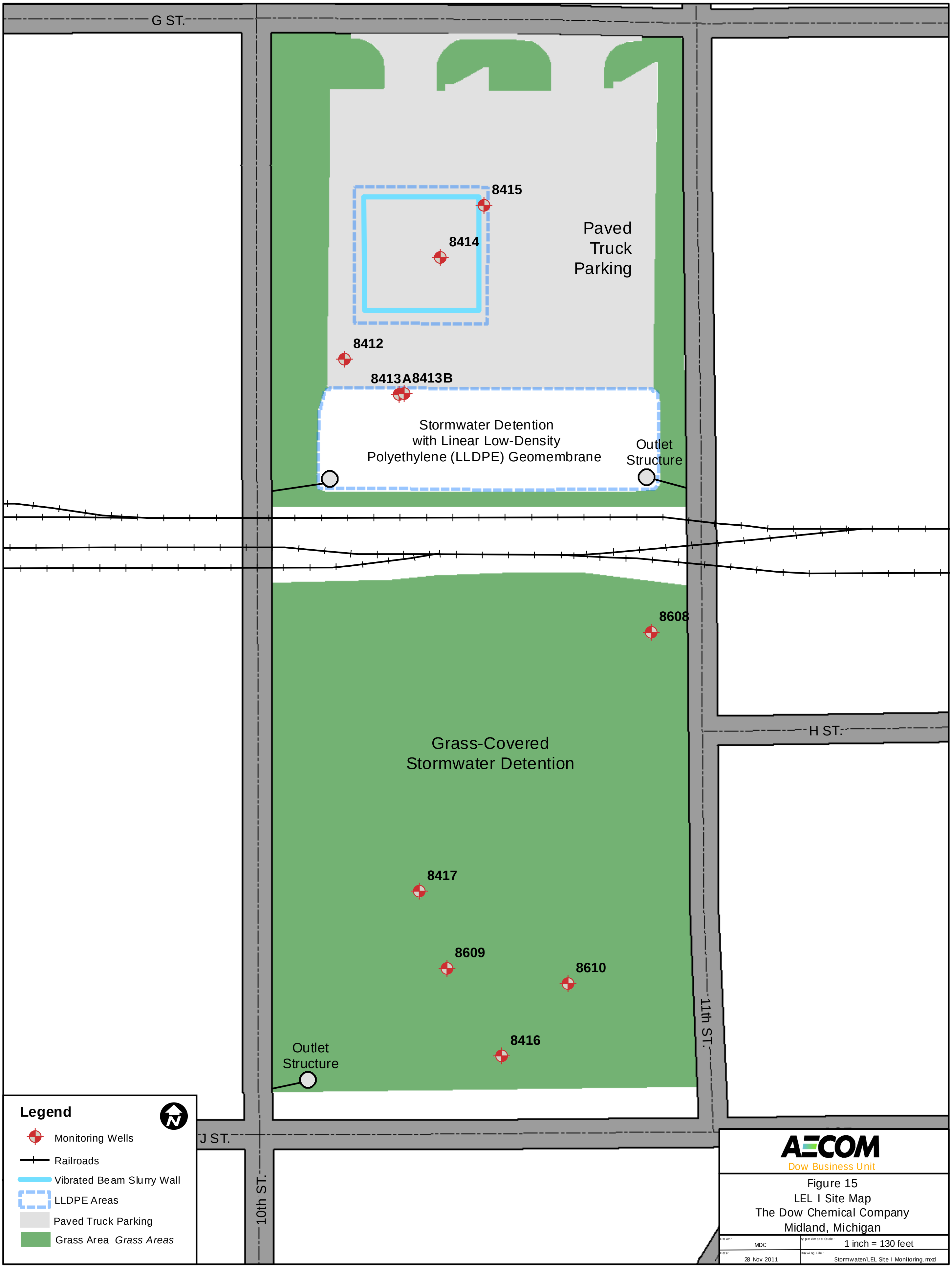


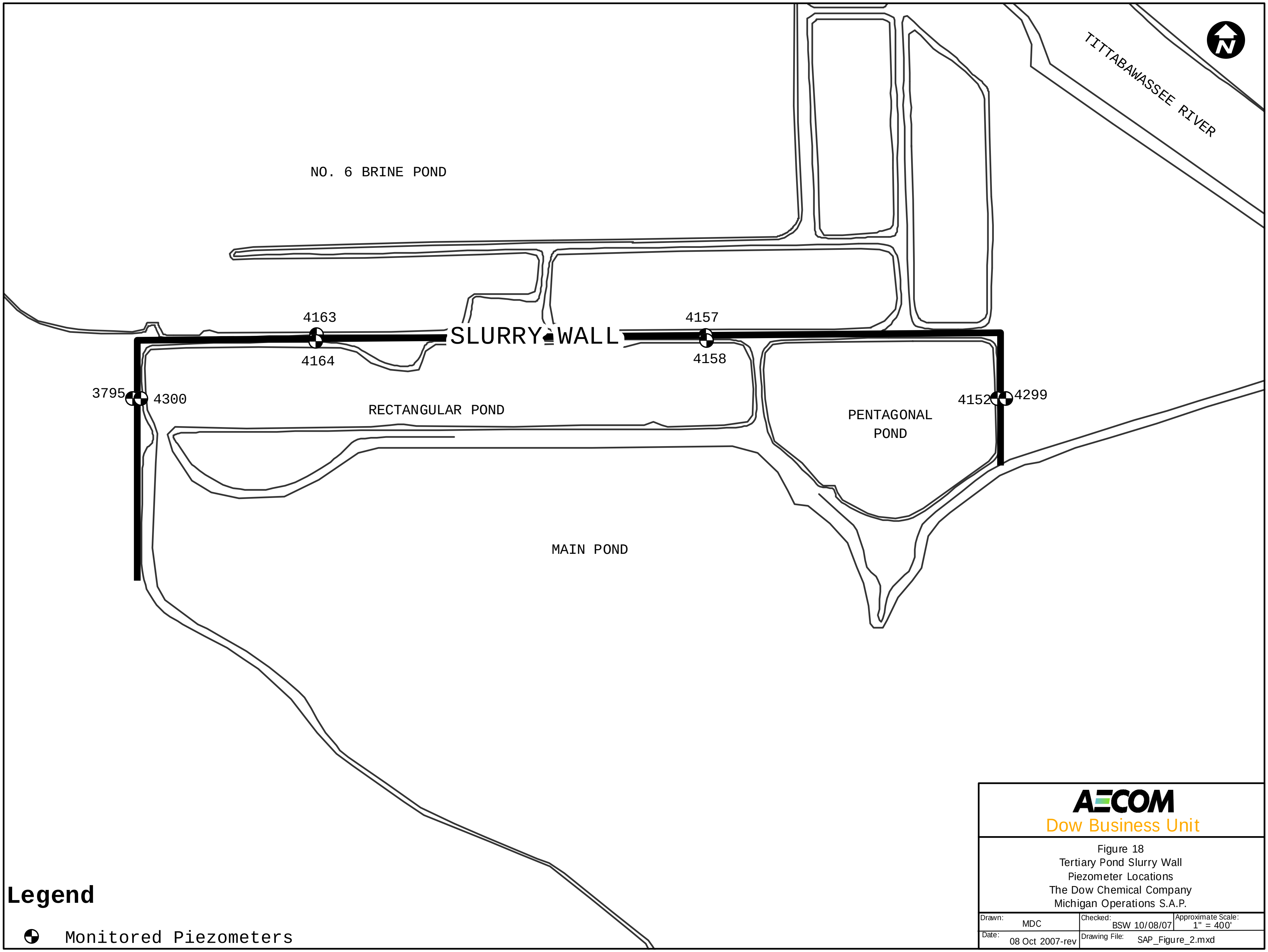
Figure 15
LEL I Site Map
The Dow Chemical Company
Midland, Michigan

AECOM
Dow Business Unit

Figure 16
LEL II & LEL III Site Map
The Dow Chemical Company
Michigan Operations

Drawn: JLH	Checked: LH	Scale: 1 inch = 200 feet
Date: 08 February 2019	Drawing File: Cap inspection/Figure17 LEL II LEL III.mxd	


PZ-9i
PZ-10i
PZ-2
PZ-6
PZ-1s
PZ-1d
PZ-12s
PZ-12i
PZ-12d
MW-3s
MW-3i
MW-3d
MW-1
PZ-13s
PZ-13i
PZ-14i
PZ-14d
1 inch = 60 feet
Feet
0 30 60 120 180 240
Legend
Vegetative Cap Area
Monitoring Well
AECOM
Dow Program
Figure 17
1925 Landfill
The Dow Chemical Company
Michigan Operations
Drawn: JH
Checked: AL
Approximate Scale: As Shown
Date: 20 August 2012
Drawing File: Facility SAP/ 1925Landfill



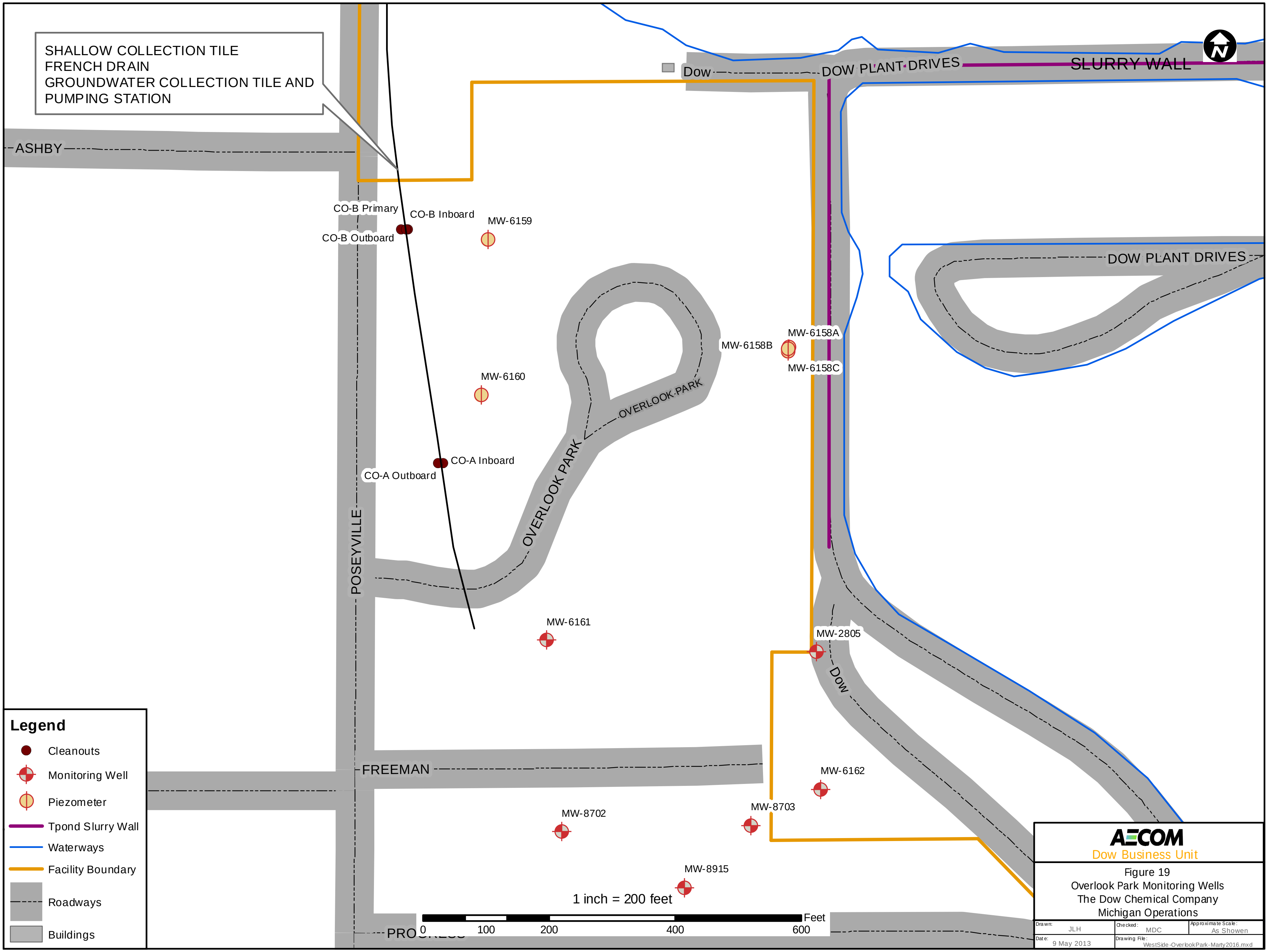
Legend

Monitored Piezometers

AECOM
Dow Business Unit

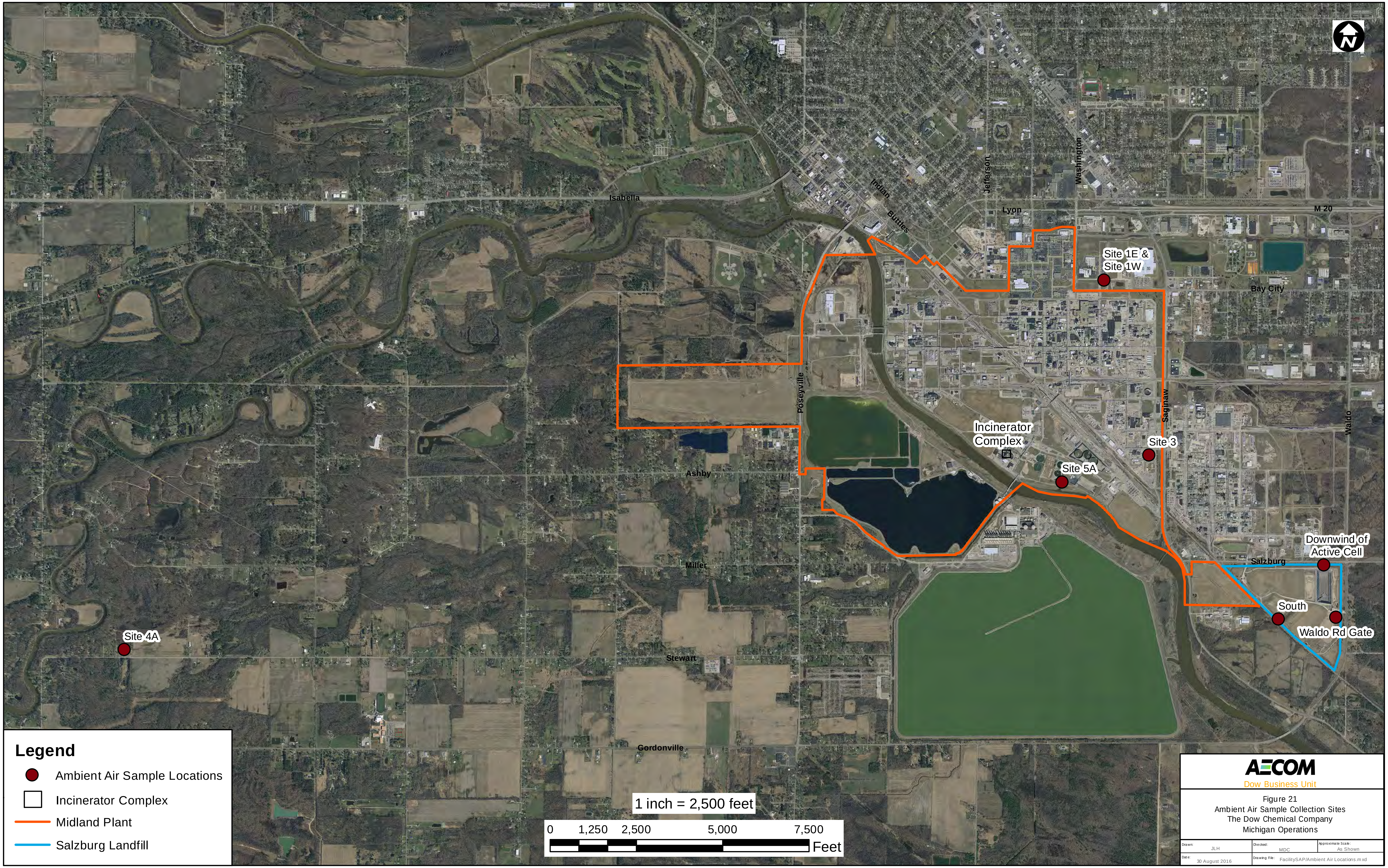
Figure 18
Tertiary Pond Slurry Wall
Piezometer Locations
The Dow Chemical Company
Michigan Operations S.A.P.

Drawn: MDC	Checked: BSW 10/08/07	Approximate Scale: 1" = 400'
Date: 08 Oct 2007-rev	Drawing File: SAP_Figure_2.mxd	



SHALLOW COLLECTION TILE
FRENCH DRAIN
GROUNDWATER COLLECTION TILE AND
PUMPING STATION
ASHBY
POSEYVILLE
FREEMAN
OVERLOOK PARK
DOW PLANT DRIVES
SLURRY WALL
Dow
CO-B Primary
CO-B Inboard
CO-B Outboard
CO-A Inboard
CO-A Outboard
MW-6159
MW-6160
MW-6161
MW-6158A
MW-6158B
MW-6158C
MW-2805
MW-6162
MW-8702
MW-8703
MW-8915
1 inch = 200 feet
0 100 200 400 600 Feet
Legend
Cleanouts
Monitoring Well
Piezometer
Tpond Slurry Wall
Waterways
Facility Boundary
Roadways
Buildings
AECOM
Dow Business Unit
Figure 19
Overlook Park Monitoring Wells
The Dow Chemical Company
Michigan Operations
Drawn: JLH
Checked: MDC
Approximate Scale: As Showen
Date: 9 May 2013
Drawing File: WestSide-OverlookPark-Marty2016.mxd

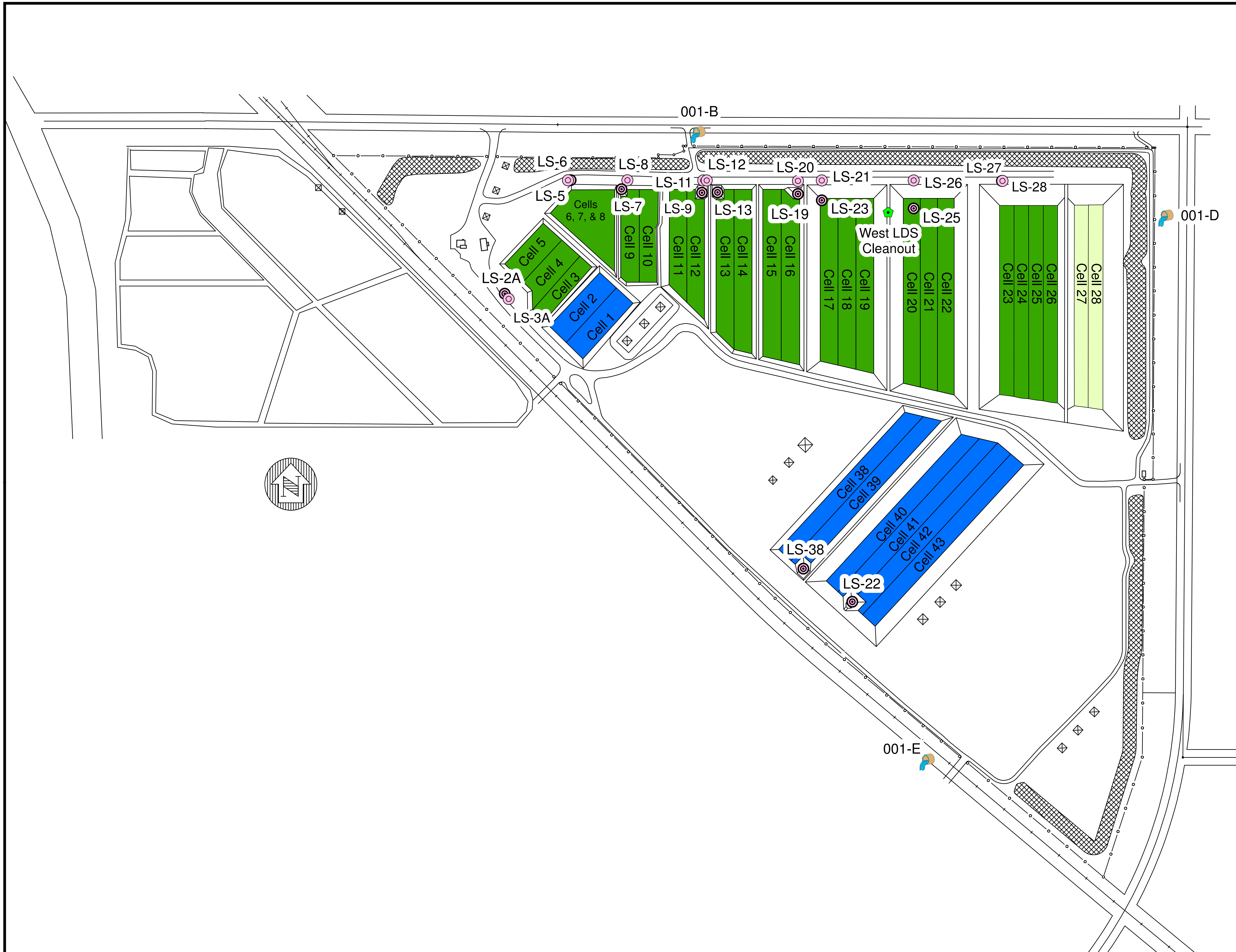
Figure 20
Soil Box Monitoring Stations
The Dow Chemical Company
Michigan Operations



AECOM
Dow Business Unit

Figure 21
Ambient Air Sample Collection Sites
The Dow Chemical Company
Michigan Operations

Drawn: JLH	Checked: MDC	Approximate Scale: As Shown
Date: 30 August 2016	Drawing File: FacilitySAP/Ambient Air Locations.mxd	



N
W E
S

THE DOW CHEMICAL COMPANY
MICHIGAN OPERATIONS
MIDLAND, MICHIGAN

AECOM

Drawn: M. Crook	Date: 01/09/2006
Review: K. Cosan	Date: 01/09/2006
Revision: M. Crook	Date: 05/26/2015
Revision:	Date:
Revision:	Date:
Revision:	Date:
Issued:	Date:
Issued	Date:
Issued:	Date:
Issued:	Date:

Legend:

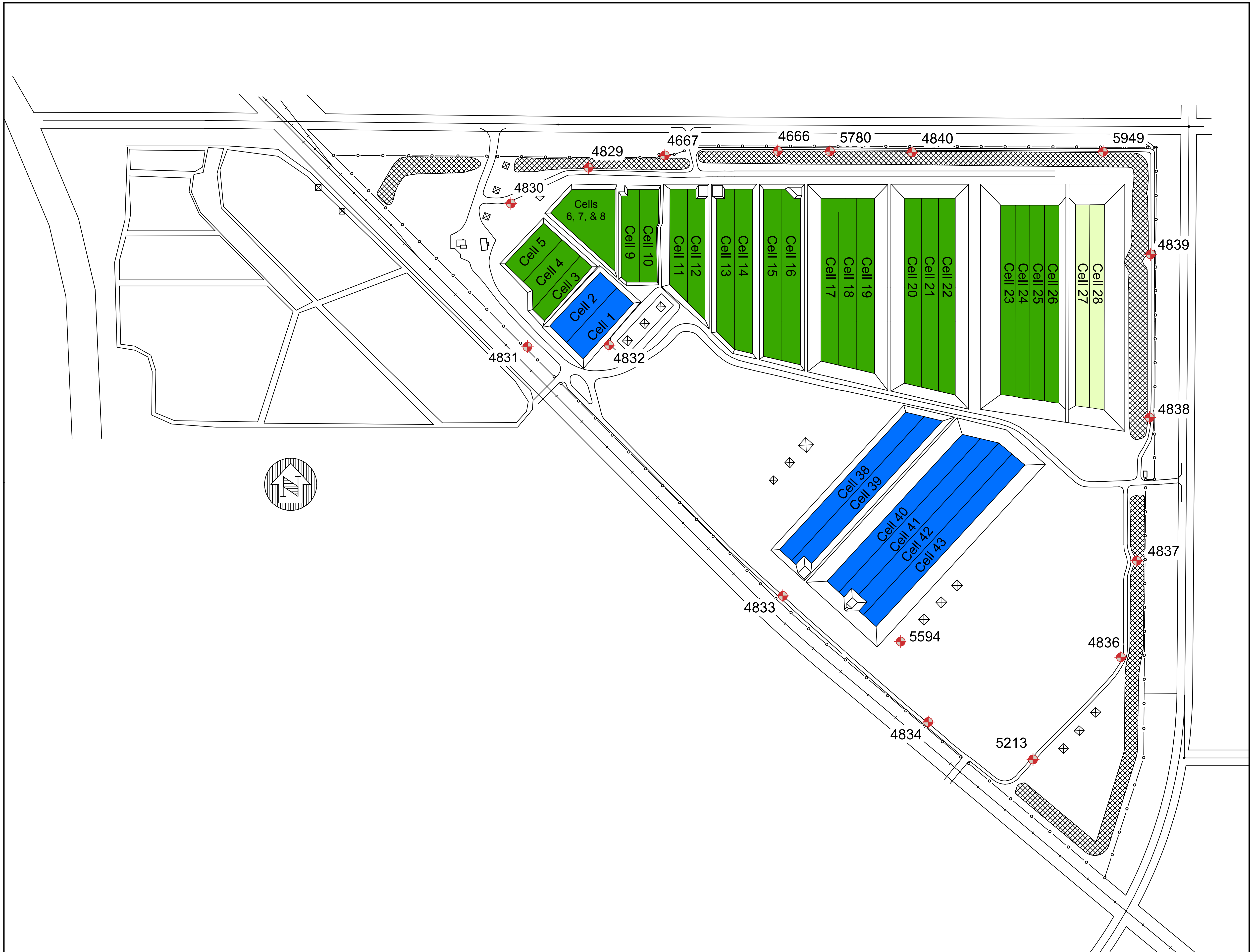
Monitoring Points

- Leachate Collection Sump
- Leak Detection System Sump
- Surface Water Outfall
- West LDS Drainage Header Cleanout
- HAZARDOUS WASTE CELLS
- NON-HAZARDOUS WASTE CELLS
- FUTURE HAZARDOUS WASTE CELLS

Drawing Scale: 0 100 200 400 600 800 Feet

Drawing Title:

Figure 22
SALZBURG LANDFILL
LEAK DETECTION, LEACHATE MONITORING & SURFACE WATER MONITORING
THE DOW CHEMICAL COMPANY
MICHIGAN OPERATIONS
MIDLAND, MICHIGAN



N W E S

THE DOW CHEMICAL COMPANY
MICHIGAN OPERATIONS
MIDLAND, MICHIGAN

AECOM
Dow Program

Drawn:	M. Crook	Date:	01/09/2006
Review:	K. Cosan	Date:	01/09/2006
Revision:	M. Crook	Date:	05/26/2015
Revision:	J. Saj	Date:	07/10/2019
Revision:		Date:	
Revision:		Date:	
Issued:		Date:	
Issued		Date:	
Issued:		Date:	
Issued:		Date:	

Monitoring Locations

- Groundwater Monitoring Well
- Hazardous Waste Cells
- Non-Hazardous Waste Cells
- Future Hazardous Waste Cells

Drawing Scale: 0 100 200 400 600 800 Feet

Drawing Title:

Figure 23
SALZBURG LANDFILL
SURFACE WATER MONITORING
THE DOW CHEMICAL COMPANY
MICHIGAN OPERATIONS
MIDLAND, MICHIGAN

Appendix A

Analytical Procedures and Quality Control

ANALYTICAL PROCEDURES

Samples taken in support of Part 111 of Act 451/RCRA requirements will be analyzed by The Dow Chemical Company (Dow) or a Dow approved third party analytical laboratory. The Dow Analytical Sciences Laboratories will maintain quality control and good laboratory practices. Solvents, calibration standards, and calibration gases are analytical reagent grade or better and carrier gases are of high purity. All instruments are standardized or calibrated according to the appropriate method. Documentation is kept of instrument calibration and any instrument repair. All transportation, storage, and waste disposal at Dow's Analytical Science Laboratories will be done in accordance with applicable state and federal regulations. Reporting limits stated in Appendix B are for the Part 111 of Act 451/RCRA detection monitoring program. At the discretion of the Analytical Sciences Laboratories management, a Dow analytical facility or an outside contractor may be used to perform any analyses. Dow will assure that the outside laboratory chosen will be able to meet reporting limits as identified in Appendix B.

Samples are analyzed in accordance to EPA methods as presented in Appendix B to the SAP. Best laboratory practices will be utilized where an EPA method does not mandate. Laboratory procedures are reviewed and updated periodically. If review reveals that changes have been made in analytical methods, this information will be sent to MDEQ. Dow will submit proposed revisions to the SAP to the Waste Management and Radiological Protection Division Chief for approval prior to implementation and will revise any other affected document accordingly. If approved, the revisions to the SAP will become part of the license without the need for a minor license modification.

Reporting limits are meant to represent typical limits achievable for clean water samples. Matrix interferences may prevent these levels from being met for some analyses. These limits are meant to be a representation of laboratory capability and may not be used for reporting purposes.

QUALITY CONTROL

Blanks are sampled and analyzed as described in the table below as a quality control check. The purpose of the checks is to detect sampling or laboratory contamination. A complete description of the quality assurance and quality control policies and procedures followed by the laboratory is provided in Appendix C to the SAP.

Quality Control Table

Media	Parameter	Field Duplicate	Trip Blank	Field Blank	Equipment Blank	Lab Blank
Groundwater	VOA	One per every 20 or fewer samples	One per sample event (analysis optional)	One per sample event	One per sample event collected and analyzed for affected media, *if non-dedicated equipment is used*.	One for each 12-hour analytical batch
	EOA					One for each set of 20 or fewer samples
	Metals/ Inorganics		Optional - Not required	Optional - Not required		One for each set of 20 or fewer samples
Leachate (also applies to RGIS And all sump/purge well chemical monitoring)	VOA	One per every 20 or fewer samples	Not required	Not required		One for each 12-hour analytical batch
	EOA					One for each set of 20 or fewer samples
	Metals/ Inorganics					One for each set of 20 or fewer samples
	D/F					One for each set of 20 samples
Leak Detection System (LDS)	VOA	One per every 20 or fewer samples	One per sample event (analysis optional)	One per sample event		One for each 12-hour analytical batch
	EOA					One for each set of 20 or fewer samples
	Metals/ Inorganics		Optional - Not required	Optional - Not required		One for each set of 20 or fewer samples
	D/F *		One per sample event (analysis optional)	One per sample event		One for each set of 20 samples
Surface Water	TOC	Collect one for each sample point (analysis dependent on results, see Section IV.D.3 of Operating License)	Not Required	One per sample event		One for each set of 20 or fewer samples
	Metals/ Inorganics					One for each set of 20 or fewer samples
Soil	D/F	One per every 20 or fewer samples	One per sample event	One blank collected for each sampling event as both Field Blank and Equipment Blank per SAP Section 8.2.		One for each set of 20 samples

Appendix B

Chemical Constituent, Analytical Method, and Reporting Limit List

Attachment B

Chemical Constituent, Analytical Method, and Reporting Limit List

Notes:

(1) A Reporting Limit (RL) is defined as the lowest level at which measurements become quantitatively meaningful. An RL is greater than the statistically determined MDLs.

(2) Methods stated in this Appendix can change and will be updated to reflect the most recently approved EPA version. A different method than what is stated in this document may be used with prior approval from the MDEQ.

(3) 1,4-Dioxane lower RL applies only to Glacial Till and Regional Aquifer detection monitoring wells.

(4) Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 12674-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141- 16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS RN 12672-29-6), Aroclor-1254 (CAS RN 11097-69-1), Aroclor-1260 (CAS RN 11096-82-5). The RL shown is an average value for PCB congeners.

(5) RLs for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans are in pg/g or ng/L depending on the matrix. The first RL is for soil samples and the second RL is for water samples.

Table I
Volatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
Acetone................................	67-64-1	2-Propanone....................	8260B	25
Acetonitrile; Methyl cyanide............	75-05-8	Acetonitrile...................	8260B	10
Acrolein................................	107-02-8	2-Propenal.....................	8260B	5
Acrylonitrile...........................	107-13-1	2-Propenenitrile...............	8260B	5
Allyl chloride..........................	107-05-1	1-Propene, 3-chloro-...........	8260B	1
Benzene.................................	71-43-2	Benzene........................	8260B	1
Bromochloromethane......................	74-97-5	Methane, bromochloro-........…	8260B	1
Bromodichloromethane....................	75-27-4	Methane, bromodichloro-........	8260B	1
Bromoform; Tribromomethane..............	75-25-2	Methane, tribromo-.............	8260B	1
Carbon disulfide........................	75-15-0	Carbon disulfide...............	8260B	5
Carbon tetrachloride....................	56-23-5	Methane, tetrachloro-..........	8260B	1
Chlorobenzene...........................	108-90-7	Benzene, chloro-...............	8260B	1
Chloroethane; Ethyl chloride............	75-00-3	Ethane, chloro-................	8260B	5
Chloroform..............................	67-66-3	Methane, trichloro-............	8260B	1
Chloroprene.............................	126-99-8	1,3-Butadiene, 2-chloro-.......	8260B	5
Dibromochloromethane; Chlorodibromomethane	124-48-1	Methane, dibromochloro-........	8260B	1
1,2-Dibromo-3-chloropropane; DBCP.......	96-12-8	Propane, 1,2-dibromo-3-chloro-.	8260B	5
1,2-Dibromoethane; Ethylene dibromide...	106-93-4	Ethane, 1,2-dibromo-...........	8260B	1
o-Dichlorobenzene.......................	95-50-1	Benzene, 1,2-dichloro-.........	8260B	1
m-Dichlorobenzene.......................	541-73-1	Benzene, 1,3-dichloro-.........	8260B	1
p-Dichlorobenzene.......................	106-46-7	Benzene, 1,4-dichloro-.........	8260B	1
trans-1,4-Dichloro-2-butene.............	110-57-6	2-Butene, 1,4-dichloro-, (E)-..	8260B	1
Dichlorodifluoromethane.................	75-71-8	Methane, dichlorodifluoro-.....	8260B	5
1,1-Dichloroethane......................	75-34-3	Ethane, 1,1-dichloro-..........	8260B	1
1,2-Dichloroethane; Ethylene dichloride.	107-06-2	Ethane, 1,2-dichloro-..........	8260B	1
1,1-Dichloroethylene; Vinylidene chloride.	75-35-4	Ethene, 1,1-dichloro-..........	8260B	1
cis-1,2-Dichloroethylene................	156-59-3	Ethene, 1,2-dichloro-, (Z)-....	8260B	1
trans-1,2-Dichloroethylene..............	156-60-5	Ethene, 1,2-dichloro-, (E)-....	8260B	1
1,2-Dichloropropane.....................	78-87-5	Propane, 1,2-dichloro-.........	8260B	1

Table I (Continued)
Volatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
cis-1,3-Dichloropropene.................	10061-01-5	1-Propene, 1,3-dichloro-, (Z)-.	8260B	1
trans-1,3-Dichloropropene...............	10061-02-6	1-Propene, 1,3-dichloro-, (E)-.	8260B	1
1,4-Dioxane.............................	123-91-1	1,4-Dioxane....................	8260B	40/20 (See Note 3)
Ethylbenzene............................	100-41-4	Benzene, ethyl-................	8260B	1
Ethyl methacrylate......................	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester.	8260B	1
2-Hexanone..............................	591-78-6	2-Hexanone.....................	8260B	5
Isobutyl alcohol........................	78-83-1	1-Propanol, 2-methyl-..........	8260B	10
Isopropylbenzene........................	98-82-8	....	8260B	1
Methacrylonitrile.......................	126-98-7	2-Propenenitrile, 2-methyl-....	8260B	5
Methyl bromide; Bromomethane............	74-83-9	Methane, bromo-................	8260B	5
Methyl chloride; Chloromethane..........	74-87-3	Methane, chloro-...............	8260B	5
Methylene bromide; Dibromomethane.......	74-95-3	Methane, dibromo-..............	8260B	1
Methylene chloride; Dichloromethane.....	75-09-2	Methane, dichloro-.............	8260B	5
Methyl ethyl ketone; MEK................	78-93-3	2-Butanone.....................	8260B	5
Methyl iodide; Iodomethane..............	74-88-4	Methane, iodo-.................	8260B	1
Methyl methacrylate.....................	80-62-6	2-Propenoic acid, 2-methyl-, methyl ester.	8260B	5
4-Methyl-2-pentanone; Methyl isobutyl ketone.	108-10-1	2-Pentanone, 4-methyl-.........	8260B	5
Pentachloroethane.......................	76-01-7	Ethane, pentachloro-...........	8260B	1
Propionitrile; Ethyl cyanide............	107-12-0	Propanenitrile.................	8260B	5
n-Propylbenzene.........................	103-65-1	....	8260B	1
Styrene.................................	100-42-5	Benzene, ethenyl-..............	8260B	1
1,1,1,2-Tetrachloroethane...............	630-20-6	Ethane, 1,1,1,2-tetrachloro-...	8260B	1
1,1,2,2-Tetrachloroethane...............	79-34-5	Ethane, 1,1,2,2-tetrachloro-...	8260B	1
Tetrachloroethylene; Perchloroethylene; Tetrachloroethene.	127-18-4	Ethene, tetrachloro-...........	8260B	1
Toluene.................................	108-88-3	Benzene, methyl-...............	8260B	1
1,1,1-Trichloroethane; Methylchloroform.	71-55-6	Ethane, 1,1,1-trichloro-.......	8260B	1

Table I (Continued)
Volatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
1,1,2-Trichloroethane..................	79-00-5	Ethane, 1,1,2-trichloro-.......	8260B	1
Trichloroethylene; Trichloroethene......	79-01-6	Ethene, trichloro-.............	8260B	1
Trichlorofluoromethane.................	75-69-4	Methane, trichlorofluoro-......	8260B	1
1,2,3-Trichloropropane.................	96-18-4	Propane, 1,2,3-trichloro-......	8260B	1
Vinyl acetate..........................	108-05-4	Acetic acid, ethenyl ester.....	8260B	5
Vinyl chloride.........................	75-01-4	Ethene, chloro-................	8260B	1
o-Xylene...............................	95-47-6	Benzene, 1,2-dimethyl-..........	8260B	1
m-Xylene...............................	108-38-3	Benzene, 1,3-dimethyl-..........	8260B	2
p-Xylene...............................	106-42-3	Benzene, 1,4-dimethyl-..........	8260B	2

Table II
Semivolatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
Acenaphthene............................	83-32-9	Acenaphthylene, 1,2-dihydro-…	8270C/8270D	1
Acenaphthylene..........................	208-96-8	Acenaphthylene.................	8270C/8270D	1
Acetophenone............................	98-86-2	Ethanone, 1-phenyl-............	8270C/8270D	10
2-Acetylaminofluorene; 2-AAF............	53-96-3	Acetamide, N-9H-fluoren-2-yl-..	8270C/8270D	10
4-Aminobiphenyl.........................	92-67-1	[1,1'-Biphenyl]- 4-amine.......	8270C/8270D	10
Aniline.................................	62-53-3	Benzenamine....................	8270C/8270D	4
Anthracene..............................	120-12-7	Anthracene.....................	8270C/8270D	1
Aramite.................................	140-57-8	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester.	8270C/8270D	10
Benzo[a]anthracene; Benzanthracene......	56-55-3	Benz[a]anthracene..............	8270C/8270D	1
Benzo[b]fluoranthene....................	205-99-2	Benz[e]acephenanthrylene.......	8270C/8270D	2
Benzo[k]fluoranthene....................	207-08-9	Benzo[k]fluoranthene.........…	8270C/8270D	2
Benzo[ghi]perylene......................	191-24-2	Benzo[ghi]perylene.............	8270C/8270D	2
Benzo[a]pyrene..........................	50-32-8	Benzo[a]pyrene.................	8270C/8270D	2
Benzoic acid............................	65-85-0	Benzoic acid...................	8270C/8270D	10
Benzyl alcohol..........................	100-51-6	Benzenemethanol................	8270C/8270D	20
Bis(2-chloroethoxy)methane..............	111-91-1	Ethane, 1,1'-[methylenebis (oxy)]bis [2-chloro-.	8270C/8270D	2
Bis(2-chloroethyl)ether.................	111-44-4	Ethane, 1,1'-oxybis[2-chloro-..	8270C/8270D	1
Bis(2-chloro-1-methylethyl) ether; 2,2'-Di- chlorodiisopropyl ether.	108-60-1	Propane, 2,2'-oxybis[1-chloro-.	8270C/8270D	10
Bis(2-ethylhexyl) phthalate.............	117-81-7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester.	8270C/8270D	5
4-Bromophenyl phenyl ether..............	101-55-3	Benzene, 1-bromo-4-phenoxy-....	8270C/8270D	2
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7	1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester.	8270C/8270D	5
p-Chloroaniline.........................	106-47-8	Benzenamine, 4-chloro-.........	8270C/8270D	20
Chlorobenzilate.........................	510-15-6	Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester.	8270C/8270D	10
p-Chloro-m-cresol.......................	59-50-7	Phenol, 4-chloro-3-methyl-.....	8270C/8270D	10
2-Chloronaphthalene.....................	91-58-7	Naphthalene, 2-chloro-.........	8270C/8270D	2
2-Chlorophenol..........................	95-57-8	Phenol, 2-chloro-..............	8270C/8270D	10

Table II (Continued)
Semivolatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
3-Chlorophenol..........................	108-43-0	Phenol, 3-chloro-..............	8270C/8270D	10
4-Chlorophenyl phenyl ether.............	7005-72-3	Benzene, 1-chloro-4-phenoxy-...	8270C/8270D	10
Chrysene................................	218-01-9	Chrysene.......................	8270C/8270D	1
m-Cresol................................	108-39-4	Phenol, 3-methyl-..............	8270C/8270D	20
o-Cresol................................	95-48-7	Phenol, 2-methyl-..............	8270C/8270D	10
p-Cresol................................	106-44-5	Phenol, 4-methyl-..............	8270C/8270D	20
2,4-D; 2,4-Dichlorophenoxyacetic acid...	94-75-7	Acetic acid, (2,4- Dichlorophenoxy)-.	8270C/8270D	10
Diallate................................	2303-16-4	Carbamothioic acid, bis(1- Methylethyl)- , S- (2,3- Dichloro-2-propenyl) ester.	8270C/8270D	10
Dibenz[a,h]anthracene...................	53-70-3	Dibenz[a,h]anthracene..........	8270C/8270D	2
Dibenzofuran............................	132-64-9	Dibenzofuran...................	8270C/8270D	5
1,2-Dibromo-3-chloropropane; DBCP.......	96-12-8	Propane, 1,2-dibromo-3-chloro-.	8270C/8270D	10
Di-n-butyl phthalate....................	84-74-2	1,2-Benzenedicarboxylic acid, Dibutyl ester.	8270C/8270D	1
o-Dichlorobenzene.......................	95-50-1	Benzene, 1,2-dichloro-.........	8270C/8270D	1
m-Dichlorobenzene.......................	541-73-1	Benzene, 1,3-dichloro-.........	8270C/8270D	1
p-Dichlorobenzene.......................	106-46-7	Benzene, 1,4-dichloro-.........	8270C/8270D	1
3,3'-Dichlorobenzidine..................	91-94-1	[1,1'-Biphenyl]- 4,4'- diamine, 3,3'-dichloro-.	8270C/8270D	20
2,4-Dichlorophenol......................	120-83-2	Phenol, 2,4-dichloro-..........	8270C/8270D	10
2,6-Dichlorophenol......................	87-65-0	Phenol, 2,6-dichloro-..........	8270C/8270D	10
Diethyl phthalate.......................	84-66-2	1,2-Benzenedicarboxylic acid, Diethyl ester.	8270C/8270D	5
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2	Phosphorothioic acid, O,O- diethyl O-pyrazinyl ester.	8270C/8270D	10
Dimethoate..............................	60-51-5	Phosphorodithioic acid, O,O- Dimethyl S-[2-(methylamino)-2- Oxoethyl] ester.	8270C/8270D	10
p-(Dimethylamino)azobenzene.............	60-11-7	Benzenamine, N,N-dimethyl-4- (phenylazo)-.	8270C/8270D	10
7,12-Dimethylbenz[a]anthracene..........	57-97-6	Benz[a]anthracene, 7,12- Dimethyl-.	8270C/8270D	10
3,3'-Dimethylbenzidine..................	119-93-7	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-.	8270C/8270D	10
alpha, alpha-Dimethylphenethylamine.....	122-09-8	Benzeneethanamine, α,α-dimethyl-.	8270C/8270D	50

Table II (Continued)
Semivolatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
2,4-Dimethylphenol......................	105-67-9	Phenol, 2,4-dimethyl-..........	8270C/8270D	10
Dimethyl phthalate......................	131-11-3	1,2-Benzenedicarboxylic acid, Dimethyl ester.	8270C/8270D	5
m-Dinitrobenzene........................	99-65-0	Benzene, 1,3-dinitro-..........	8270C/8270D	10
4,6-Dinitro-o-cresol....................	534-52-1	Phenol, 2-methyl-4,6-dinitro-..	8270C/8270D	50
2,4-Dinitrophenol.......................	51-28-5	Phenol, 2,4-dinitro-...........	8270C/8270D	50
2,4-Dinitrotoluene......................	121-14-2	Benzene, 1-methyl-2,4-dinitro-.	8270C/8270D	5
2,6-Dinitrotoluene......................	606-20-2	Benzene, 2-methyl-1,3-dinitro-.	8270C/8270D	5
Dinoseb; DNBP; 2-sec-Butyl- 4,6-dinitrophenol	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-.	8270C/8270D	10
Di-n-octyl phthalate....................	117-84-0	1,2-Benzenedicarboxylic acid, Dioctyl ester.	8270C/8270D	5
Diphenylamine...........................	122-39-4	Benzenamine, N-phenyl-.........	8270C/8270D	10
2,6-Diphenylphenol......................	2432-11-3	....	8270C/8270D	10
Disulfoton..............................	298-04-4	Phosphorodithioic acid, O,O-Diethyl S-[2-(ethylthio)ethyl]ester	8270C/8270D	10
Ethyl methanesulfonate..................	62-50-0	Methanesulfonic acid, ethyl Ester.	8270C/8270D	10
Famphur.................................	52-85-7	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl]-O,O-dimethyl ester.	8270C/8270D	10
Fluoranthene............................	206-44-0	Fluoranthene...................	8270C/8270D	1
Fluorene................................	86-73-7	9H-Fluorene....................	8270C/8270D	1
Hexachlorobenzene.......................	118-74-1	Benzene, hexachloro-...........	8270C/8270D	2
Hexachlorobutadiene.....................	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-Hexachloro-.	8270C/8270D	2
Hexachlorocyclopentadiene...............	77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-.	8270C/8270D	10
Hexachloroethane........................	67-72-1	Ethane, hexachloro-............	8270C/8270D	1
Hexachlorophene.........................	70-30-4	Phenol, 2,2'-methylenebis[3,4,6-Trichloro-.	8270C/8270D	75
Hexachloropropene.......................	1888-71-7	1-Propene, 1,1,2,3,3,3-Hexachloro-.	8270C/8270D	10
Indeno(1,2,3-cd)pyrene..................	193-39-5	Indeno[1,2,3-cd]pyrene.........	8270C/8270D	2

Table II (Continued)
Semivolatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
Isodrin................................	465-73-6	1,4,5,8- Dimethanonaphthalene,1,2,3,4,10,10- hexachloro- 1,4,4a,5,8,8a hexahydro- (1α, 4α, 4aβ, 5β, 8β,8aβ)–.	8270C/8270D	10
Isophorone.............................	78-59-1	2-Cyclohexen-1-one, 3,5,5- Trimethyl-.	8270C/8270D	1
Isosafrole.............................	120-58-1	1,3-Benzodioxole, 5-(1- Propenyl)-.	8270C/8270D	10
Kepone.................................	143-50-0	1,3,4-Metheno-2H-cyclobuta- [cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6- Decachlorooctahydro-	8270C/8270D	25
Methapyrilene..........................	91-80-5	1,2,Ethanediamine, N,N-dimethyl- N'-2- pyridinyl- N'-(2- Thienylmethyl)-.	8270C/8270D	10
3-Methylcholanthrene....................	56-49-5	Benz[j]aceanthrylene, 1,2- Dihydro-3-methyl-.	8270C/8270D	10
Methyl methanesulfonate.................	66-27-3	Methanesulfonic acid, methyl Ester.	8270C/8270D	10
2-Methylnaphthalene.....................	91-57-6	Naphthalene, 2-methyl-.........	8270C/8270D	5
Methyl parathion; Parathion methyl......	298-00-0	Phosphorothioic acid, O,O- Dimethyl O-(4-nitrophenyl) Ester.	8270C/8270D	10
Naphthalene.............................	91-20-3	Naphthalene....................	8270C/8270D	1
1,4-Naphthoquinone......................	130-15-4	1,4-Naphthalenedione...........	8270C/8270D	10
1-Naphthylamine.........................	134-32-7	1-Naphthalenamine..............	8270C/8270D	10
2-Naphthylamine.........................	91-59-8	2-Naphthalenamine..............	8270C/8270D	10
o-Nitroaniline..........................	88-74-4	Benzenamine, 2-nitro-..........	8270C/8270D	50
m-Nitroaniline..........................	99-09-2	Benzenamine, 3-nitro-..........	8270C/8270D	50
p-Nitroaniline..........................	100-01-6	Benzenamine, 4-nitro-..........	8270C/8270D	50
Nitrobenzene............................	98-95-3	Benzene, nitro-................	8270C/8270D	2
o-Nitrophenol...........................	88-75-5	Phenol, 2-nitro-...............	8270C/8270D	10
p-Nitrophenol...........................	100-02-7	Phenol, 4-nitro-...............	8270C/8270D	50
4-Nitroquinoline 1-oxide................	56-57-5	Quinoline, 4-nitro-, 1-oxide...	8270C/8270D	10
N-Nitrosodiethylamine...................	55-18-5	Ethanamine, N-ethyl-N-nitroso-.	8270C/8270D	10

Table II (Continued)
Semivolatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
N-Nitrosodimethylamine..................	62-75-9	Methanamine, N-methyl-N-nitroso-	8270C/8270D	5
N-Nitrosodi-n-butylamine................	924-16-3	N-Nitrosodi-n-butylamine	8270C/8270D	10
N-Nitrosodiphenylamine..................	86-30-6	Benzenamine, N-nitroso-N-phenyl-	8270C/8270D	2
N-Nitrosodipropylamine; Di-n-propylnitrosamine.	621-64-7	1-Propanamine, N-nitroso-N-Propyl-.	8270C/8270D	2
N-Nitrosomethylethylamine...............	10595-95-6	Ethanamine, N-methyl-N-nitroso-	8270C/8270D	10
N-Nitrosomorpholine.....................	59-89-2	Morpholine, 4-nitroso-.........	8270C/8270D	10
N-Nitrosopiperidine.....................	100-75-4	Piperidine, 1-nitroso-.........	8270C/8270D	10
N-Nitrosopyrrolidine....................	930-55-2	Pyrrolidine, 1-nitroso-........	8270C/8270D	10
5-Nitro-o-toluidine.....................	99-55-8	Benzenamine, 2-methyl-5-nitro-.	8270C/8270D	10
Parathion...............................	56-38-2	Phosphorothioic acid, O,O-Diethyl-O-(4-nitrophenyl) Ester	8270C/8270D	10
Pentachlorobenzene......................	608-93-5	Benzene, pentachloro-..........	8270C/8270D	10
Pentachloroethane.......................	76-01-7	Ethane, pentachloro-...........	8270C/8270D	10
Pentachloronitrobenzene.................	82-68-8	Benzene, pentachloronitro-.....	8270C/8270D	10
Pentachlorophenol.......................	87-86-5	Phenol, pentachloro-...........	8270C/8270D	50
Phenacetin..............................	62-44-2	Acetamide, N-(4-ethoxyphenyl)..	8270C/8270D	10
Phenanthrene............................	85-01-8	Phenanthrene...................	8270C/8270D	1
Phenol..................................	108-95-2	Phenol.........................	8270C/8270D	10
p-Phenylenediamine......................	106-50-3	1,4-Benzenediamine.............	8270C/8270D	25
[4-(2-phenylisopropyl)phenol]...........	599-64-4	Phenol, 4-Cumyl.................	8270C/8270D	10
o-Phenylphenol..........................	90-43-7	Phenol, 2-phenyl-...............	8270C/8270D	10
Phorate.................................	298-02-2	Phosphorodithioic acid, O,O-Diethyl S- [(ethylthio)methyl] Ester	8270C/8270D	10
2-Picoline..............................	109-06-8	Pyridine, 2-methyl-............	8270C/8270D	10
Pronamide...............................	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-Dimethyl-2-propynyl)-.	8270C/8270D	10
Pyrene..................................	129-00-0	Pyrene.........................	8270C/8270D	1
Pyridine................................	110-86-1	Pyridine.......................	8270C/8270D	10
Safrole.................................	94-59-7	1,3-Benzodioxole, 5-(2-Propenyl)-.	8270C/8270D	10
Silvex; 2,4,5-TP........................	93-72-1	Propanoic acid, 2-(2,4,5-Trichlorophenoxy)-.	8270C/8270D	2
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid.	93-76-5	Acetic acid, (2,4,5-Trichlorophenoxy)-.	8270C/8270D	2
1,2,3,4-Tetrachlorobenzene..............	634-66-2	Benzene, 1,2,3,4-tetrachloro-..	8270C/8270D	10

Table II (Continued)
Semivolatile Organics

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
1,2,4,5- Tetrachlorobenzene.............	95-94-3	Benzene, 1,2,4,5-tetrachloro-..	8270C/8270D	10
2,3,4,6-Tetrachlorophenol...............	58-90-2	Phenol, 2,3,4,6-tetrachloro-...	8270C/8270D	10
Tetraethyl dithiopyrophosphate; Sulfotepp.	3689-24-5	Thiodiphosphoric acid ([(HO)2P(S)]2O), tetraethyl ester	8270C/8270D	10
4-tert-Butylphenol......................	98-54-4	....	8270C/8270D	10
o-Toluidine.............................	95-53-4	Benzenamine, 2-methyl-.........	8270C/8270D	10
1,2,3-Trichlorobenzene..................	87-61-6	Benzene, 1,2,3-trichloro-......	8270C/8270D	10
1,2,4-Trichlorobenzene..................	120-82-1	Benzene, 1,2,4-trichloro-......	8270C/8270D	2
2,4,5-Trichlorophenol...................	95-95-4	Phenol, 2,4,5-trichloro-.......	8270C/8270D	5
2,4,6-Trichlorophenol...................	88-06-2	Phenol, 2,4,6-trichloro-.......	8270C/8270D	10
O,O,O-Triethyl phosphorothioate.........	126-68-1	Phosphorothioic acid, O,O,O-Triethyl ester.	8270C/8270D	10
sym-Trinitrobenzene.....................	99-35-4	Benzene, 1,3,5-trinitro-.......	8270C/8270D	10

Table III
Metals

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL/RL (ug/L)
Aluminum................................	(Total)	Aluminum......................	6020	100
Antimony................................	(Total)	Antimony......................	6020/7040	2/1
Arsenic.................................	(Total)	Arsenic.......................	6020/7060A	1
Barium..................................	(Total)	Barium........................	6020/6010B	5/5
Beryllium...............................	(Total)	Beryllium.....................	6020/6010B	1/3
Cadmium.................................	(Total)	Cadmium.......................	6020/6010B	0.2/5
Calcium.................................	(Total)	Calcium.......................	6020/6010B	300/1000
Chromium................................	(Total)	Chromium......................	6020/6010B	1/20
Cobalt..................................	(Total)	Cobalt........................	6020/6010B	5/15
Copper..................................	(Total)	Copper........................	6020/6010B	1/10
Iron....................................	(Total)	Iron..........................	6020/6010B	50/20
Lead....................................	(Total)	Lead..........................	6020/7421	1
Lithium.................................	(Total)	Lithium.......................	6010B	8
Magnesium...............................	(Total)	Magnesium.....................	6020/6010B	250/1000
Manganese...............................	(Total)	Manganese.....................	6020/6010B	5/5
Mercury.................................	(Total)	Mercury.......................	7470A	0.2
Nickel..................................	(Total)	Nickel........................	6020/6010B	2/25
Potassium...............................	(Total)	Potassium.....................	6020*/6010B	250/100
Selenium................................	(Total)	Selenium......................	6020/7740	2/1
Silver..................................	(Total)	Silver........................	6020/7761	0.5
Sodium..................................	(Total)	Sodium........................	6020/6010B	250/1000
Thallium................................	(Total)	Thallium......................	6020/7841	1/2
Tin.....................................	(Total)	Tin...........................	6020/7870	10/8000
Vanadium................................	(Total)	Vanadium......................	6020/6010B	2/10
Zinc....................................	(Total)	Zinc..........................	6020/6010B	10/10

Table IV
Anions

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
Ammonia	7664-41-7	Ammonia	350.1	50
Bicarbonate........................	(Total)	Bicarbonate....................	SM2320	10,000
Carbonate..........................	(Total)	Carbonate......................	SM2320	10,000
Chloride...........................	(Total)	Chloride.......................	9056	1000
Cyanide............................	57-12-5	Cyanide........................	9012A	5
Fluoride...........................	(Total)	Fluoride.......................	9056	1000
Sulfate............................	(Total)	Sulfate........................	9056	2000
Sulfide............................	18496-25-8	Sulfide........................	376.2	100

Table V
Other Constituents

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
Aldrin..................................	309-00-2	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro- (1α,4α, 4aβ, 5α,8α,8aβ)-	8081A	0.02
alpha-BHC...............................	319-84-6	Cyclohexane, 1,2,3,4,5,6-Hexachloro-,(1α, 2α,3β, 4α,5β,6β)-	8081A	0.02
beta-BHC................................	319-85-7	Cyclohexane, 1,2,3,4,5,6-Hexachloro-,(1α,2β, 3α,4β, 5α,6β)-	8081A	0.02
delta-BHC...............................	319-86-8	Cyclohexane, 1,2,3,4,5,6-Hexachloro-,(1α,2α, 3α, 4β,5α,6β)-	8081A	0.02
gamma-BHC; Lindane......................	58-89-9	Cyclohexane, 1,2,3,4,5,6-Hexachloro-,(1α, 2α, 3β, 4α,5α,6β)-	8081A	0.02
Chlordane;(each isomer alpha and gamma).	57-74-9	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a- hexahydro-.	8081A	0.02
4,4'-DDD................................	72-54-8	Benzene 1,1'-(2,2-Dichloroethylidene) bis[4-Chloro-.	8081A	0.02
4,4'-DDE................................	72-55-9	Benzene, 1,1'-(dichloroethenylidene) bis[4-Chloro-.	8081A	0.02

Table V (Continued)
Other Constituents

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
4,4'-DDT................................	50-29-3	Benzene, 1,1'-(2,2,2-trichloroethylidene) bis[4-chloro-.	8081A	0.02
Dieldrin................................	60-57-1	2,7:3,6-Dimethanonaphth [2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a- octahydro-, (1aα,2β, 2aα, 3β,6β,6aα,7&bet,7aα)-	8081A	0.02
Endosulfan I...........................	959-98-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aβ,6α,9&a,9aβ)-.	8081A	0.02
Endosulfan II..........................	33213-65-9	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aα, 6β,9β, 9aα)-	8081A	0.05
Endosulfan sulfate.....................	1031-07-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3,3-dioxide.	8081A	0.05

Table V (Continued)
Other Constituents

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (ug/L)
Endrin..................................	72-20-8	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a- octahydro-, (1aα, 2β,2aβ, 3α,6α, 6aβ,7β, 7aα)–	8081A	0.02
Endrin aldehyde.........................	7421-93-4	1,2,4-Methenocyclopenta[cd]pentalene-5-carboxaldehyde, 2,2a,3,3,4,7-Hexachlorodecahydro-, (1α,2β, 2aβ,4β, 4aβ,5β,6aβ,6b&be,7R*)-	8081A	0.05
Heptachlor..............................	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-........	8081A	0.02
Heptachlor epoxide......................	1024-57-3	2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,7,7-Heptachloro-1a,1b,5,5a,6,6a,-Hexahydro-, (1aα,1bβ,2α,5&,5aβ,6β,6aα)	8081A	0.02
Methoxychlor............................	72-43-5	Benzene, 1,1'-(2,2,2,trichloroethylidene)bis [4-methoxy-.	8081A	0.05
Polychlorinated biphenyls; PCBs.........	See Note 4	1,1'-Biphenyl, chloro (derivatives)	8082	0.1
Total Organic Carbon (TOC)...............			9060*	1000

Toxaphene..............................	8001-35-2	Toxaphene......................	8081	0.2

Table V (Continued)
Other Constituents

Common Name	CAS #	Chemical Abstract Service Index Name	Method	RL (See Note 5 regarding units)
2378-TCDD	1746-01-6		1613b	1, 0.01
Total TCDD	41903-57-5		1613b	
12378-PeDD	40321-76-4		1613b	5, 0.05
Total PeCDD	36088-22-9		1613b	
123478-HxCDD	39227-28-6		1613b	5, 0.05
123678-HxCDD	57653-85-7		1613b	5, 0.05
123789-HxCDD	19408-74-3		1613b	5, 0.05
Total HxCDD	34465-46-8		1613b	
1234678-HpCDD	35822-46-9		1613b	5, 0.05
Total HpCDD	37871-00-4		1613b	
OCDD	3268-87-9		1613b	10, 0.1
2378-TCDF	51207-31-9		1613b	1, 0.01
Total TCDF	55722-27-5		1613b	
12378-PeCDF	57117-41-6		1613b	5, 0.05
23478-PeCDF	57117-31-4		1613b	5, 0.05
Total PeCDF	36088-22-9		1613b	
123478-HxCDF	70648-26-9		1613b	5, 0.05
123678-HxCDF	57117-44-9		1613b	5, 0.05
234678-HxCDF	60851-34-5		1613b	5, 0.05
123789-HxCDF	72918-21-9		1613b	5, 0.05
Total HxCDF	34465-46-8		1613b	
1234678-HpCDF	67562-39-4		1613b	5, 0.05
1234789-HpCDF	55673-89-7		1613b	5, 0.05
Total HpCDF	38998-75-3		1613b	
OCDF	390001-02-0		1613b	10, 0.1

Appendix C

Quality Assurance Program

DOW ENVIRONMENTAL LABORATORY

QUALITY ASSURANCE PROGRAM (QAP)

TABLE OF CONTENTS

Section

1.0 INTRODUCTION

1.1. The objective of any laboratory providing environmental analyses to The Dow Chemical Company (Dow) must be to provide data of sufficiently known quality to meet or exceed applicable permit and other legal requirements. The same objectives apply to internal company laboratories and to external contract labs. This manual provides guidelines under which general permit requirements, method requirements, and work instructions, protocol specifications or standard operating procedures (SOP) will be generated and maintained. Dow will ensure all internal and external laboratories meet the criteria of this plan.

1.2. It is not the intent of this document to restate specific quality control (QC) procedures already contained in referenced methods or permits since they are not applied universally.

1.3. An organizational chart will be available upon request for Michigan Department of Environmental Quality (MDEQ) review.

1.4. Definitions:

- QSDs: Quality Support Documents including SOPs, work instructions and protocol specifications.
- SW-846 Methods – EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. [1]
- Compendium IO Methods – Determination of Inorganic Compounds in Ambient Air. [2]
- Compendium TO Methods – Determination of Toxic Organic Compounds in Ambient Air. [3]
- Deviation: Any activity that is not performed in accordance with the QSD is considered a deviation. Deviations may or may not affect the quality of the data. If a deviation is going to be required on a routine basis, a request in writing to formally modify the QSD should be initiated by the appropriate personnel.

2.0 QUALITY ASSURANCE

2.1. The objective of the Quality Assurance (QA) function is to assure that procedures are in place to produce data of known and documented quality that will meet the quality objectives of the users of the data. This is accomplished through the Analytical Sciences Laboratory quality management system.

2.2. Data quality assurance will be documented through annual reporting of pertinent QA/QC review information to management. The report should provide a summary of key QA activities during the applicable time period. The report will describe quality indicators observed and will document which indicators meet and do not meet acceptable QC performance criteria.

2.3. Any unacceptable quality indicators observed will be followed up with corrective action. If no corrective action is taken, reasons for this decision will be stated. Corrective actions taken, or reasons for no action needed, will be documented.

3.0 QUALITY CONTROL

3.1 Introduction

3.1.1 The procedures indicated below apply in most cases. Specific QC requirements relevant to particular activity or analyses are contained in the pertinent field, QSDs, SW-846 analytical procedures, EPA methods, or Compendium IO/TO methods.

3.1.2 Throughout the QAP document the term QSD will be used to refer to a work instruction, protocol specification, and/or SOP.

3.2 General Quality Control for field procedures are outlined as follows (Pre-sampling procedures, post-sampling procedures, equipment cleaning procedures, field data collection procedures, analytical sample specifications, and chain-of-custody information are included as individual attachments to the SAP):

3.2.1 Non-standard field information which is not found in the method should be documented in a field log with appropriate signatures and dates.

3.2.2 All pre-field activities such as equipment checkout, calibrations, and container storage and preparations will be documented.

3.2.3 Documentation of all field activities and conditions, which may have an effect on the analyses, is required.

3.2.4 Documentation of any deviations from the QSD is required. The extent of and the reason for the deviation should be documented.

3.2.5 Duplicate samples, trip, field, and equipment blanks will be taken when appropriate, as specified by the analyses methods, or project specifications.

3.3 General laboratory quality control requirements are taken from 40 CFR Part 136 [4] and SW-846.

3.3.1 The person doing the analysis (the analyst) will do an initial demonstration of their capability to generate acceptable accuracy and precision on water samples. The results of this demonstration will be kept on file.

3.3.2 The analyst will determine whether their equipment and standards meet the requirements for the analysis.

3.3.3 Before starting the analysis, the analyst will demonstrate the measurement system is in control. Instrument calibration and calibration frequency will be done in accordance with the applicable standard, method, and/or QSD

3.3.4 The appropriate blanks (trip, reagent, and field, if necessary), duplicate samples or spikes, and standards will be analyzed as specified in the applicable standard, method, DQO request, and/or QSD.

3.3.5 Deviations, errors, deficiencies, and other non-standard events that fall outside established acceptance criteria should be investigated. In some instances, corrective action may be needed to resolve the problem and restore proper functioning to the system. The investigation of the problem and any subsequent corrective action taken should be documented.

3.3.6 Specific analytical procedures, reporting limits, QA/QC frequencies, and precision and accuracy requirements used in the laboratory and field programs will change with time. These changes will be reviewed. If the review reveals that the changes have been made in analytical methods or QA/QC procedures, the appropriate documents will be updated without prior approval from the agency unless prohibited by a license or other regulatory agreement. All updates will be communicated via applicable management of change procedures.

3.3.7 Instrument maintenance logs will be kept, signed, and dated.

3.3.8 Sample handling and custody requirements will follow the applicable standard, method, and/or QSD.

4.0 WORK INSTRUCTIONS, PROTOCOL SPECIFICATIONS or SOP

4.1 QSDs are documents which will require modification or be discontinued due to matrix, instrument, and method changes. In order to assure ourselves that the proper QSD is being used, each document will have an effective date printed on them.

4.2 Non-current QSDs will be kept according to Dow's records retention policy.

4.3 A list of QSD documents will be kept available at the analytical facility. The list will be updated on a biannual basis, or as needed.

4.4 Communication of changes will be done via Management of Change (MOC) or equivalent process.

5.0 REPORTING OF DATA

5.1 Data will be reported according to the analytical methods and the established laboratory procedures that will be used for the analyses.

5.1.1 All information used in the calculations (e.g., raw data, calibration files, tuning records, results of standard additions, interference check results, and blank or background-correction protocols) should be recorded in order to enable reconstruction of the final result at a later date. Raw data is defined as that data which cannot be easily derived or recalculated from other information.

5.2 Since the data are reported to the agency under a variety of laws, permits, and other agreements, a single specific guideline cannot be established for reporting data. In general, data will be submitted to the agency under the following guidelines:

5.2.1 Data may be reported using a reporting limit (RL) or a laboratory practical quantitation limit (PQL).

5.2.1.1 The RL is defined as the lowest level at which measurements become quantitatively meaningful. An RL is equal to or greater than the statistically determined method detection limits (MDLs).

5.2.1.2 The PQL is the lowest concentration used in the calibration of the measurement system. RLs will be reported for detection monitoring programs. In the absence of a specified RL, a PQL will be reported. Data will not be reported below the applicable RL or PQL.

5.2.2 All data will be reported to two significant figures. If not reported to two significant figures, an explanation for the deviation will be provided.

5.2.3 Indirect measurement instruments such as pH, electrical resistance, oxidation potential, etc. will be reported as indicated on the instrument display.

5.3 The raw data must be signed and dated by the analyst.

5.4 As an additional procedure, all data generated by the Dow Analytical Laboratories will be peer reviewed by an analyst qualified in the analytical technique. The signature of the reviewer and the date of the review must be documented with the raw data.

5.5

5.6 Random QA/QC checks of data packets and report the results of the review to the laboratory QA/QC supervisor.

6.0 PERSONNEL RECORDS

6.1 Training and proficiency records will be maintained by employees and stored in the Dow Analytical Sciences building.

6.2 Records of the personnel qualifications, education, and experience will be updated annually.

7.0 RECORDS

7.1 Records will be maintained that provide direct supporting evidence and the necessary technical support to legally defend the data reported by the laboratory. This will require a copy of any report issued and/or any supporting documentation for the report.

7.2 Field and laboratory notebooks will have the pages numbered and appropriate signatures and dates. Each book will be assigned an identification number. The book will be retained according to Dow's Records Management Manual.

7.3 Retained laboratory records will include the following:

7.3.1 Calibration records and traceability of standard and reagents.

7.3.2 Documentation of the accuracy of all working standards against primary grade standards.

7.3.3 A method or QSD should be referenced. A Standard or EPA method should not be referenced unless the analysis is being performed EXACTLY as described in the published method. (See SW- 846, chapter 1, paragraph 4.3.4) [1]

7.4 QSDs shall be kept according to Dow records retention guidelines.

7.5 Records will be stored in a clean, dry area under with controlled access. Access to the archive is limited to administrative, quality and management personnel. Records removed from the archive will be signed out and tracked.

8.0 REFERENCE DOCUMENTS

1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, U.S. Government Printing Office, Publication Number: 955-001-00000-1.

2. IO Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, EPA/625/R-96/01a, July 1999.

3. Compendium of Methods for the Determination of Toxic Organic in Ambient Air, EPA/625/R-96/010b, January 1999.

4. "Code of Federal Regulations," 40 CFR 136, Appendix A, pp. 490 and 491, (1992). [Greg to check this reference.]

Appendix D

Chain of Custody Example

ENVIRONMENTAL ANALYSIS LABORATORY
(EXAMPLE) CHAIN OF CUSTODY (EXAMPLE)

Facility Sampled:	Parameter:	AL-EL Number
		Field Log Book:
		Field Log Pages:
		Frequency:
		Account No:

Number of Containers	Sample Identification	Sample Date	Filtered?	Preservatives Added?

Printed Name(s) of Sampler (s):

Signature:____ Date:__________

I have received____samples in good condition from the sampler(s).

Signature:____ Date:__________

I have received___samples in good condition from the preceding person

Signature:____ Date:__________

This original copy shall remain with the samples at all time.
After completion of all testing, this copy shall be attached to the original report.
Refer to sample log book for sample time.

Note: this is an example COC Only

Appendix E

Survey Schedule

SURVEY SCHEDULE

Monitoring well and piezometers are re-surveyed periodically to update top of casing (TOC) elevations. The monitoring wells and piezometers are also re-surveyed if damage to the well or piezometer is identified during a routine inspection or otherwise noted.The survey location for each well or piezometer will be the north side of the casing for the purpose of taking accurate and consistent static water level measurements. The re-survey schedule is shown below.

Program	TOC Survey Frequency
East Side RGIS Piezometers	Every Five Years
West Side RGIS Piezometers	Every Five Years
Poseyville Landfill Corrective Action Piezometers	Every Five Years
Poseyville Landfill Corrective Action Monitoring Wells	Every Five Years
Glacial Till and Regional Aquifer Detection Monitoring Wells (Include Salzburg Monitoring Wells)	Every Five Years
Tertiary Pond Slurry Wall Piezometers	Every Five Years
Tertiary Pond Recovery Monitoring Well	Every Five Years
Sludge Dewatering Facility Perimeter and Detection Wells	Every Five Years
Facility Shallow Groundwater Monitoring Piezometers (includes monitoring wells from various groundwater monitoring programs)	Every Five Years

Appendix F

Example Field Data Sheet

Field Data Sheet

Monitoring Well Purging and Sampling Form

Project: Facility SAP	**Well ID:**	**Sample Time:**	**Weather:** Ambient Temp: Wind (speed/direction):
Location:	**Well Depth:**	**Purge Start:**	
Field Personnel:	**Well Diameter:**	**Purging Device:**	General Weather Conditions:
Date:	***Well Volume:**	**Pump Intake Depth:**	
Initial SWL & Time:	****Purge Volume:**	**Pumped Dry (circle):** Y / N	Ground Conditions (circle): wet / dry / snow (amount) / ice
Well Type: (circle) Monitoring Well	Flowing Well	**Screen Interval:**	

Reading	**Time** (24HR)	**Water Level** (ft) (BTOC)	**Volume Purged** (L) or (gal)	**Purge Rate** (~mL/min)	**pH** (Units) (±0.1)	**Specific Conductivity** (μS/cm) (±3%)	**ORP** (mV) (±10mV)	**D.O.** (mg/L) (±10% if ≥0.3)	**Turbidity** (NTU) (±10% if ≥20)	**Temp** (ºC)	**Field Blank Collected (circle):** Y / N **Time:** **Duplicate Collected (circle):** Y / N **Time:** **Comments**
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

SAMPLE DESCRIPTION: Color: Odor: Y / N	**Bottle**	**Preservative**	**Required**	**Collected**	**Analyses/Method**	**Analytical Lab**
Clarity: Other Info:						
Calibration:						
Other Instrumentation Notes/Info:						
Other Info:						
Analytical Lab: **TA = Test America,** **D = Dow,** **O = Other_______________**						

*** Well volume = (Well Depth - SWL) x (volume conversion factor)** ****Purge Volume = Well Volume x 3**

Well Diameter (in)	**1**	**1.5**	**2**	**3**	**4**	**6**	**8**	**10**
Volume conversion factor(gal/ft)	0.04	0.09	0.16	0.37	0.65	1.47	2.61	4.08
Volume conversion factor(L/ft)	0.15	0.35	0.61	1.40	2.46	5.56	9.88	15.44

Additional Notes on Back

Reading	**Time** (24HR)	**Water Level** (ft) (BTOC)	**Volume Purged** (L) or (gal)	**Purge Rate** (~mL/min)	**pH** (Units) (±0.1)	**Specific Conductivity** (μS/cm) (±3%)	**ORP** (mV) (±10mV)	**D.O.** (mg/L) (±10% if ≥0.3)	**Turbidity** (NTU) (±10% if ≥20)	**Temp** (ºC)	**Comments**
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

Additional Notes:

Appendix G

Example Well Inspection Sheet

Appendix G

Well Inspection Checklist

Well Inspection Form

Project:		Facility	Notes:
Location:		Ash Pond	
Inspection Completed By:			

Well #	Clearly Labeled		Pressure Gauge Functional and Calibrated (fow flowing wells)		Protective cover in good condition and locked		Water pooling around base or inside cover		Stinging insects or animals inside cover		Well has a cap / plug		Any damage to well casing (leaking, broken, etc.)		Comments / Corrections	Time	Date	Corrective Action ID
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No				
6165																		
6166																		
6167																		
6168																		
6169																		

Appendix H

Temporal Evaluation of Stiff Geochemical Diagram Patterns

Temporal Evaluation of Stiff Geochemical Diagram Patterns

Stiff diagrams are used as a graphical representation of the general chemistry in a water source or sample. A polygonal shape is created from four horizontal axes extending from a central vertical axis. Cation concentrations are plotted on the left of the vertical axis and anions are plotted on the right. The data are plotted in four rows and the points are connected to form a polygon. These shapes are unique for a unit or body of water. Stiff diagrams are widely used because they facilitate rapid comparison of water quality from distinctive shapes resulting from changes in general water chemistry.

Stiff diagrams may also be used to evaluate changes in general water chemistry over time from a single monitoring point. Two possible causes of long term geochemistry are possible in groundwater monitoring: (1) response of natural systems to a 'source' or (2) natural variability. Evaluating changes in major ion geochemistry over time can make subtle changes more apparent. In the case of (1), ion ratios would trend towards the "source" ratio as a release slowly mixed with ambient groundwater. Changes in overall chemistry (or Stiff pattern) evaluated against the hypothesis that a release of a specific chemistry would cause a consistent change to the overall geochemistry. In the case of (2), changes in geochemistry from one monitoring period to the next should be random, periodic and not consistent.

Temporal Stiff diagrams include results of both current and the previous monitoring period. In addition, the difference between periods (or difference pattern) is plotted as a relative percent difference (RPD). An example Temporal Stiff diagram is included as Figure 1. In the case of (1) above, the difference pattern would be expected to be consistent and similar between periods. The figures in Figure 2 demonstrate this condition. In the case of (2), the difference pattern would be expected to fluctuate between periods. The patterns in Figure 3 demonstrate this condition.

Because errors and uncertainty are present in all measurements, subtle trends in geochemistry over time may be masked and difficult to discern by difference pattern alone. Therefore, additional trend evaluation is prudent. Many trend evaluation methods are available. Consistent changes in tracking parameter concentrations may be detected by comparing the average concentrations for each calendar year against a threshold level of 50% increase each year over a period of two years. Long term changes in geochemistry may be natural, and can be compared to the possible sources that exist to determine if they are truly a result of a new release.

Appendix I

Soil Box Data Evaluation

SOIL BOX
DATA EVALUATION PLAN

THE DOW CHEMICAL COMPANY
MIDLAND PLANT & SALZBURG LANDFILL
MIDLAND, MICHIGAN

Revised: September, 2019

Table of Contents

1.0 INTRODUCTION

The Surface Soil Exposure Control Program is a component of the Worker Exposure Control Program for the Midland Plant and Salzburg Landfill. The program is designed to address direct contact exposure to surface soils located at the Salzburg Landfill and the Facility, initially including enhancement of buffer areas in the northeast corner and east perimeter of the Facility adjacent to Saginaw Road. Soil sampling was performed at the Midland Plant to follow-up EPA and Dow studies completed in the early 1980s. Enhancements to cover at the site were conducted, beginning in 2001, in areas prioritized for early action (summarized in Attachment A), based on results of trace organic analysis of surface soils for dioxins and furans in 1996 and 1998. The Salzburg Landfill soil boxes were constructed at Salzburg Landfill in 2002, as part of the T-Pond Transportation Monitoring Program.

This Soil Box Data Evaluation Plan (Data Evaluation Plan) has been prepared to comply with Operating License Condition IX.K. of The Dow Chemical Company's (Dow) Hazardous Waste Management Facility Operating License, dated September 30, 2015.

This document contains the methodology for evaluating the Soil Box analytical results, establishing the appropriate action levels, and recommending actions to be undertaken should these levels be exceeded. A summary of the history and evolution of the Soil Box Monitoring Program, Data Evaluation Plan (including a summary of historical data), and the 2015 evaluation of program effectiveness are provided in Attachment A. Recommendations presented in Attachment A were implemented during 2016.

1.1 Purpose

The purpose of the Monitoring Program is to verify that on-site measures completed as part of the *Worker Exposure Control Program* (Attachment 19 of the License), are effectively preventing the migration of dioxins and furans from facility surficial soils via track out and blowing dust, and to gauge the potential concern from dust generated by vehicles in high traffic locations.

At Salzburg Landfill the purpose of the soil monitoring program is to evaluate the potential for a release of waste constituents to the surface soils from the landfill. The purpose of this Plan is to determine whether a significant change in dioxin and furan concentrations occurred in comparison to the baseline levels in the soil boxes.

This Data Evaluation Plan specifies how to identify and characterize whether a significant change is occurring in dioxin and furan concentrations in the designated Soil Boxes, which in turn, may indicate the potential for off-site dioxin and furan migration. This Data Evaluation Plan presents the approach for evaluating Soil Box Monitoring results in accordance with License Conditions IX.A. and IX.K.1.(a) through (d) and Table 2-V of the SAP (Attachment 15 of the License). This document contains the methodology for evaluating the analytical results of the annual, semi-annual or quarterly monitoring events, establishing the appropriate action levels based on rate of change ("flux rate"), and recommending actions to be undertaken should these levels be exceeded. Results of the data evaluation for monitoring events are submitted in the Quarterly Environmental Monitoring Reports.

Correspondingly, the result of data evaluation will assist to determine whether the soil exposure control actions are adequate, in light of multiple lines of evidence and other site observations. The following sections describe the components of the Data Evaluation Plan.

1.2 Overview of Soil Box Monitoring

The currently approved Soil Box Monitoring Program consists of nine soil box monitoring points established in the vicinity of exit points from the Dow Midland Plant facility and at downwind locations along the north and east perimeter of the facility. Four perimeter Soil Boxes were established in the vicinity of exit points of the Dow facility. These Soil Boxes are located at 608-Gate, 1791-Gate, 52-Gate and 19-Gate. Two soil boxes are located in the area of the former Northeast Perimeter Greenbelt Area (NEP-A and NEP-B), and two Soil Boxes are located in the area of the former Saginaw Road Greenbelt Area (SR-A and

SR-B). SR-A was removed in 2018 because of construction activity in the area. SR-A will be rebuilt nearby its original location in 2019, once the construction is complete. A fifth Soil Box is located between the two former Greenbelt Areas (SR-C).

Three Soil Boxes were constructed in 2002, and placed adjacent to transportation routes at the landfill. SLF Soil Box 1 (SLFSB-01) is located along the internal landfill road north of the recently closed cell and the truck wash station; SLF Soil Box 2 (SLFSB-02) is located on the downwind side of the road just inside Gate 90 (based on the prevailing westerly wind direction); and SLF Soil Box 3 (SLFSB-03) was located in the upwind direction from the landfill. In 2016, SLF Soil Box 3 was removed and replaced with a new location SLF Soil Box 4 (SLFSB-04), constructed downwind of the active hazardous waste disposal cells, inside the perimeter berm. Figure 20 of the Midland Plant and Salzburg Landfill Sampling and Analysis Plan (SAP) depicts the locations of the facility Soil Boxes.

Current sampling procedures are listed in the SAP, Attachment 15 of the License, approved by MDEQ in 2015. The Monitoring Program contains information pertinent to this Data Evaluation Plan, and should be referenced for details such as the target analyte list, detection limits, and sampling protocols.

The size of each Soil Box is approximately eight inches high and ten feet square. They were constructed using non-treated wood or cement blocks. The Soil Boxes are lined with a geotextile fabric before being filled with clean topsoil. Grass is then planted to establish a vegetative cover. The Soil Boxes are maintained without the use of commercial fertilizer or herbicides. Vegetation height is maintained through the use of electrically powered cutting equipment. Surface soil composite samples are collected from the Soil Boxes to evaluate the potential migration of dioxins and furans via vehicular track-out or fugitive dust, as described in the Monitoring Program. To maintain the sensitivity of the soil in the box, the Soil Boxes may be rebuilt approximately every ten years beginning in 2015. A Soil Box with a soil concentration below 10 ppt may not be considered to be rebuilt. The Gate 19 soil box was the only soil box to be rebuilt, which took place during 2016.

One composite sample is collected from each Soil Box on a semi-annual basis (approximately May and October), and the collected samples are analyzed for the seventeen 2,3,7,8-substituted dioxin and furan isomers. The dioxin and furan data are expressed as toxic equivalent concentrations (TEC) based on the WHO-TEC factors (World Health Organization 2005 Toxic Equivalency Factors). For samples where a specific isomer was not detected, one-half the detection limit of that isomer is used to calculate the WHO-TEC for that sample. The WHO-TEC results for field duplicate samples are averaged with the corresponding primary sample results for this data evaluation.

2.0 METHODS FOR DETECTING CHANGES FROM BASELINE CONDITIONS

Data analysis for detecting a consistent change in dioxin and furan concentrations from baseline conditions will be done by comparing the rate of change ("flux rate") to a pre-determined criterion, and a rules-based system that identifies relevant patterns in these comparisons over time. The analysis will include constructing a series of time plots for each location, including the plotting of semi-annual data, flux rate, and rolling average of flux rate (i.e., an average flux rate for the last four periods). The following sections describe the methods for detecting a change from historic conditions.

2.1 Establishing a Baseline Concentration

For the Soil Box at 19-Gate, given a longer history of establishment, a semi-annual sampling schedule was generally followed from 2002 to 2009; which included developing the baseline between 2002 and 2006, and a quarterly sampling schedule between 2010 and present. Baseline concentrations for the Soil Boxes at 608-Gate and 1791-Gate were established by eight sampling events spaced throughout 2008; otherwise, a semi-annual sampling schedule was generally followed.

Baseline concentrations for the new soil boxes, or re-built soil boxes will be established by analyzing a total of three replicate composite soil samples for each Soil Box.

2.2 Constructing Time Plots

Time plots were constructed for each of the Soil Boxes. The following time plots were prepared, based on the data collected up to April 2015, and are shown in Attachment B (Summary of Soil Box Data and Time Plots):

- Time-series plot of TEC concentrations
- Flux rate plot of TEC concentrations (flux rate = TEC concentration of this period minus TEC concentration of last period)
- Rolling average (4-period) flux rate plot (average of the four most recent flux rates)

If a field duplicate was collected, the primary and duplicate results were averaged to form a single data point to ensure data independence.

On at least a semi-annual basis, samples will be collected from each of the eight locations and plotted onto the aforementioned time plots.

2.3 Data Evaluation for Soil Boxes

TEC concentration data obtained during each monitoring period will be plotted as described above. If the results are below the pre-determined *flux rate screening level* <u>and</u> *rolling average flux rate screening level*, no further action will be required, and the semi-annual monitoring effort will be continued. If the results are above one or both screening levels, additional information is necessary (as described below) to determine if the results truly represent a consistent and significant increase. If it is determined that a consistent and significant increase exists, and that this condition represents potential for off-site migration, appropriate action(s) (as described by Condition IX.K.1.(c) or IX.K.1.(d). of the License) will be considered and taken. Detailed descriptions of the specific evaluations are listed in Section 2.4.

2.4 Tiered Evaluation

Based on the observation of data collected thus far, the *flux rate screening level* and *rolling average flux rate screening level* are established based on the length of the monitoring period, and are summarized in the following table.

Monitoring Period	Flux Rate Screening Level	Rolling Average Flux Rate Screening Level
3 months	1.25 ppt	0.5 ppt
6 months	2.5 ppt	1.0 ppt
12 months	5.0 ppt	2.5 ppt

In addition, a conservative value of 30 ppt will also be used as a "threshold value." This threshold value is approximately 60% below the Act 451, Part 201 Residential Direct Contact to soil criterion of 90 ppt.

Step-wise or tiered "decision point" evaluations will be used to determine whether the data indicate a shift (i.e., a consistent upward change) in dioxin and furan concentrations, and/or if further action is warranted. Step-wise decision points are established in the following sequence, and Figures 1 and 2 depicts a flowchart of the decision process described below for the Midland Plant and Salzburg Landfill facilities, respectively:

Tier I

a. If the flux rate for a Soil Box exceeds Tier I flux rate screening level, a verification sample will be collected from the particular location within a reasonable and practical time frame. If the verification sample confirms the flux rate exceedance, the sampling frequency will increase to Tier II for this particular location.
b. If the rolling average flux rate for a Soil Box exceeds the Tier I screening level, the sampling frequency will increase to Tier II for this particular location.

Tier II

a. After a minimum of eight monitoring events (i.e., at the increased sampling frequency in Tier II), the sampling frequency will revert to Tier I if at any given monitoring event, the flux rate returns to less than Tier II flux rate and rolling average flux rate screening levels.
b. During the increased sampling frequency period (i.e., at Tier II), if the flux rate exceeds the Tier II flux rate screening level <u>or</u> the Tier II rolling average flux rate screening level, <u>consecutively</u> for four monitoring periods, additional evaluation will be conducted at the Tier III level (see also Section 2.5). In addition, if the threshold value of 30 ppt is reached, additional Tier III level evaluation, and/or collecting verification sample(s), will be considered.

2.5 Trend Analysis and Additional Evaluation

In the event that a location reaches Tier III, further evaluation may be conducted, including comparison of data to regional background levels, previous sample results, data from other Soil Boxes, and whether the fingerprint is distinguishable from historic samples. Further statistical analysis may also be warranted and could include assessment of duplicate sample variability, formal trend analysis, and/or other methods, as appropriate.

Any volatility in the duplicates or trends identified by the data will be evaluated in an attempt to determine the cause of the change. If a trend is identified, further evaluation is required, as discussed above. However, the identification of a trend, in and of itself, does not indicate noncompliance.

In accordance with Conditions IX.K.1.(c) and IX.K.1.(d) of the License, if the evaluation of the data indicates the potential for off-site dioxin and furan migration, action(s) to eliminate the source of the contamination will be made by proposing a modification to the Worker Exposure Control Program, or other appropriate actions for review and approval by MDEQ. This modification will follow the requirements of Condition XI.C.4. of the License.

3.0 SUMMARY OF EXISTING MONITORING DATA

Attachment B shows the data collected for the Soil Boxes (through April 2015) and the associated time plots.

3.1 608-Gate

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the 608-Gate Soil Box location were within the screening levels during the entire monitoring period.

3.2 1791-Gate

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the 1791-Gate Soil Box location were within the screening levels during the entire monitoring period.

3.3 NEP-A

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the NEP-A Soil Box location were within the screening levels during the entire monitoring period.

3.4 NEP-B

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the NEP-B Soil Box location were within the screening levels during the entire monitoring period.

3.5 NEP-C

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the NEP-C Soil Box location were within the screening levels during the entire monitoring period.

3.6 SR-A

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the SR-A Soil Box location were within the screening levels during the entire monitoring period. SR-A Soil Box was removed during 2018 because of construction activities along Saginaw Road. It is planned to rebuild SR-A nearby its original locations during 2019, once construction activities are complete.

3.7 SR-B

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the SR-B Soil Box location were within the screening levels during the entire monitoring period.

3.8 19-Gate

The flux rate for dioxin and furan WHO-TEC concentrations exceeded the 2.5 ppt screening level in May 2008. An increase in sampling frequency to quarterly was implemented in March 2009. A total of nine quarterly samples have been collected from March 2009 through June 2011. Of these quarterly events, no exceedance of the 3-month period screening levels (flux rate or rolling average flux rate) was observed consecutively for four quarters, and hence, the Tier III level evaluation process was not triggered.

Following the tiered evaluation method described in Section 2.4, after eight quarterly monitoring events, the sampling frequency reverted to semi-annually beginning in Fourth Quarter of 2011. The flux rate for the 19-Gate Soil Box was again measured above the semi-annual screening criterion during Fourth Quarter of 2013. The Tier III level evaluation process has not been triggered during this period. Sampling returned to semi-annually beginning in First Quarter 2016. The soil box was re-built in the fall of 2016, and monitoring of the soil box will begin in Fourth Quarter 2016.

3.9 52-Gate Soil Box

This soil box was newly installed in 2016, and no data have yet been obtained for the soil box.

3.10 SLF Soil Box 1

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the SLF Soil Box 1 location were within the screening levels during the entire monitoring period, this soil box was taken out of service and removed in 2016.

3.11 SLF soil Box 2

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the SLF Soil Box 2 location were within the screening levels during the entire monitoring period.

3.12 SLF Soil Box 3

The flux rate and rolling average flux rate for dioxin and furan WHO-TEC concentrations collected from the SLF Soil Box 3 location were within the screening levels during the entire monitoring period. Soil Box 3 was removed in 2016 and replaced with Soil Box 4. Soil Box 3 was located within the Sludge Dewatering Facility which is no longer an active site.

3.13 SLF Soil Box 4

This soil box was newly installed in 2016, and only two years’ worth of data has been obtained.

4.0 REFERENCES

Soil Box and Greenbelt Monitoring Program, The Dow Chemical Company, December 10, 2004, Revised February 7, 2007.

ProUCL Version 5.0.00 Technical Guide Statistical Software for Environmental Applications for Data Sets with and without Non-detect Observations. USEPA. September, 2013.

FIGURES

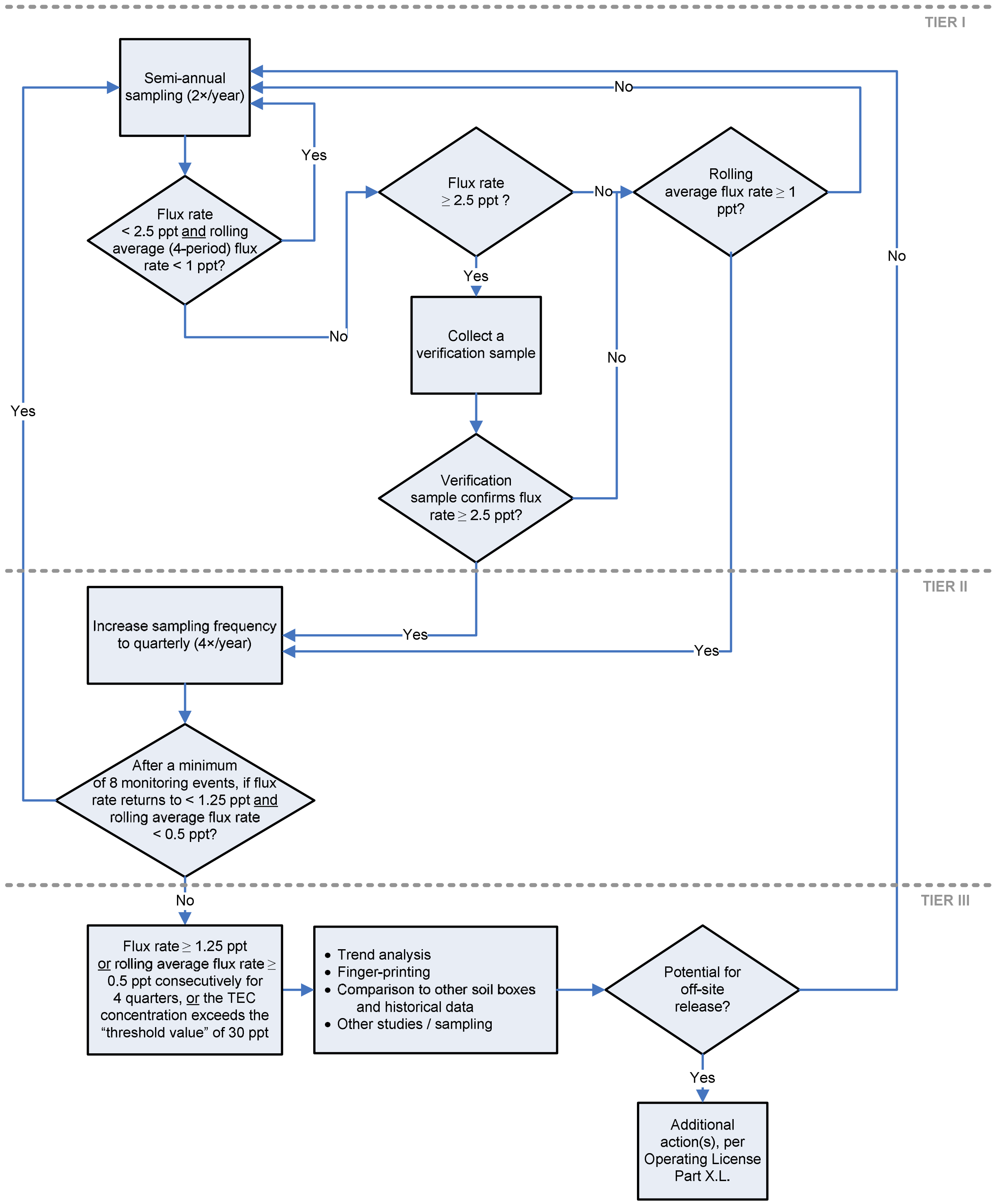


Figure 1. Midland Plant and Salzburg Landfill Monitoring Data Evaluation Flowchart

ATTACHMENTS

ATTACHMENT A

Attachment A

Surface soil samples were collected within the Dow facility located in Midland, Michigan in the early 1980s. Samples were collected by the U.S. Environmental Protection Agency (USEPA) and Dow and analyzed for dioxin and furan congeners. Additional surface soil samples were later collected within Michigan Operations in 1996, 1998, 2005 and 2006 by Dow and MDEQ.

In part, as a result of these investigations, a site Soil and Groundwater Exposure Control Program (later expanded to a more inclusive Worker Exposure Control Program) was developed in part to address measurable levels of residual dioxin and furan congeners in the surface soils within the Dow facility. Since the initial development of the Worker Exposure Control Program, a number of interim activities had been completed, including the following:

- Placement of barrier controls by covering certain existing surface areas within Michigan Operations with a minimum of six-inches of topsoil and establishing vegetation;
- Enhancing the Greenbelt Areas in the northeast corner and the eastern perimeter;
- Placement of barrier controls by covering some unused areas with stone or gravel;
- Restricting traffic patterns and traffic access to identified areas;
- Improving dust management by replacing selected gravel parking areas with asphalt;
- Additional cover has been placed over significant areas of the Facility to provide storm water detention, with the added benefit of providing a direct contact barrier to the existing soils;
- Enhancing Michigan Operation’s Fugitive Dust Control Program; and
- Enhancing Michigan Operation’s internal environmental excavation procedures.

On-going activities include monitoring the effectiveness of the above enhancements, by specifically monitoring the Soil Boxes semi-annually.

Dow was required by the Operating License issued on June 12, 2003, to submit a plan to establish a soil monitoring program that shall include soil box monitoring and monitoring of the Green Belt Areas located on Dow property north and east of the facility fence line along Bay City and Saginaw Roads. The Soil Box and Greenbelt Monitoring Program (Monitoring Program) was prepared by Dow and submitted to Michigan Department of Environmental Quality (MDEQ) on December 10, 2004, and revised on February 7, 2005. MDEQ was notified by Dow on August 28, 2007 that two new Soil Boxes were going to be constructed due to the reconfiguration of the perimeter fence and traffic patterns. MDEQ approved the new locations on October 30, 2008 via the approval of the Facility Sampling and Analysis Plan.

The Soil Box at 608-Gate was installed in October 2007, and the Soil Box at 1791-Gate was installed in November 2007. These Soil Boxes were installed at the new gates to replace Soil Boxes that were located at closed 2-Gate and 11-Gate.

As part of the amendment to the monitoring program in 2013, the Greenbelt Areas in the northeast perimeter of Midland Plant were changed from a gridded surface plot that contained thirty-three sample nodes to a series of Soil Boxes consistent with the approach used at other locations around the site. A multiple Soil Box approach was more applicable to monitor the northeast perimeter Greenbelt Area of Midland Plant. Therefore, the previous sampling scheme of using twenty-foot by one-hundred-foot gridded plots was discontinued.

For reference, soil data collected through June 2011 from the former Greenbelt Area surface plots are included with this Attachment as Table 1.

The Salzburg Landfill soil box monitoring program began in 2002. This program monitored conditions during disposal of T-Pond solids in the Salzburg Landfill, for the T-Pond Solids Removal Project at The Dow Chemical Company in Midland, Michigan. The T-Pond Transportation Monitoring Program provided verification that the operational practices and safeguards used during the transportation and landfilling of T-Pond solids were effective in preventing dispersal of the solids and constituents of concern.

Sampling of the soil boxes under the T-Pond Transportation Monitoring Program started in October 2002 and was completed in May 2006. Upon the completion of T-Pond Solids Removal Project in October 2006, Dow was no longer required to conduct the semi-annual sampling of the Soil Boxes at the landfill. However, Dow continued the semi-annual sampling of the Soil Boxes to maintain a congruent dataset, in anticipation of the new Operating License being issued in 2009. The Salzburg Soil Box Monitoring Program was approved in 2009.

5.0 PROGRAM EFFECTIVENESS

The Data Evaluation Plan approved November 12, 2010 indicated that the Soil Monitoring Program, and its associated screening levels would be re-evaluated in five years (2015) to determine if the program purpose of *"effectively preventing the migration of dioxins and furans from facility surficial soils via track out and blowing dust"* is being met. Dow agreed to submit a report documenting the conclusions and recommendations for the Soil Monitoring Program and Data Evaluation Plan to MDEQ for review and approval by December 31, 2015. This section includes the results of the evaluation and satisfies these requirements.

5.1 Soil Monitoring Program

The current program consists of soil boxes at the three main gates out of the facility, five soil boxes along the northeast margins of the facility, in the down-wind and three soil box locations at Salzburg Landfill. Gate 52 (along South Saginaw Road) has been increased usage since 2010, so an additional soil box should be placed adjacent to the gate exit (see Section 4.3).

Prior to updating the soil monitoring program in 2010, the program included a hybrid system of soil boxes and greenbelt areas (summarized in Attachment A). A unified monitoring and evaluation system has streamlined and simplified the evaluation of data, making it much more effective and consistent.

5.2 Screening Levels

The screening levels were evaluated independently using a non-parametric Mann Kendall trend evaluation of the existing data for each soil box using ProUCL software (USEPA, 2013). The trend evaluations identified an increasing trend for 19-gate, 608-gate and 1791-gate soil boxes. No trends were identified for the remaining soil boxes using both methods.

The Mann-Kendall test results can be further interpreted beyond the ‘yes’ or ‘no’ outputs. For example, comparing the absolute values of the standardized S-values can provide some contrast in the magnitude of the trends. Positive or negative S-values generally indicate an increasing or decreasing trend, respectively. S-values close to zero do not indicate a trend. The S-values for the 19-gate soil box are significantly higher than those computed for 608-gate and 1791-gate soil boxes. Similarly, the approximated P-values (test statistics) are very close to the tabulated P-values for 608-gate and 1791-gate soil boxes (differing only by tenths of a percent). In addition, the maximum value detected at the 19-gate soil box is 19.5 ppt, where the maximum detected value from the 608-gate and 1791-gate soil boxes was 2.73 ppt.

Contrasting the Mann-Kendall test with the methods outlined in Section 2.4, the Mann-Kendall test is sensitive to statistical trends in the results, but it appears to be insensitive to the relative concentrations (the trends identified at 608-gate and 1791-gate at concentrations that are difficult to distinguish from background). Therefore, the screening levels developed for this monitoring program are effective at identifying increases in concentrations in the soil boxes, while reducing “nuisance triggers” of standard methods like the Mann-Kendall test.

To-date the Salzburg Landfill Soil Boxes have not exceeded the flux rate screening criteria or the rolling average flux rate screening criteria.

5.3 Conclusions and Recommendations

5.3.1 Midland Plant

A review of the soil box monitoring program and evaluation methods has been completed and has determined that the program purpose of *"effectively preventing the migration of dioxins and furans from facility surficial soils via track out and blowing dust"* is being met. Two additional follow-up actions listed below have been identified to strengthen the existing program and will ensure the on-going effectiveness of the program.

Increases in the concentration of the soil within the 19-gate soil box have been observed between 2008 and 2014. While the concentrations appear to have stabilized, the baseline concentrations are now at or slightly over 10 ppt TEQ. Provided the 4Q2015 sample does not exceed the relevant screening levels identified in Section 2.4, a proposal may be submitted to MDEQ for their review and approval to re-build the soil box to maintain the sensitivity of the monitoring program.

Due to the increased traffic at 52-gate, along South Saginaw Road, one additional soil box was constructed at the exit point in 2015.

5.3.2 Salzburg Landfill

Upon review of the history and implementation of the current Soil Box Program, Data Evaluation Plan and associated screening levels, the Plan is working as it was intended for the detection of dioxins and furans above baseline.

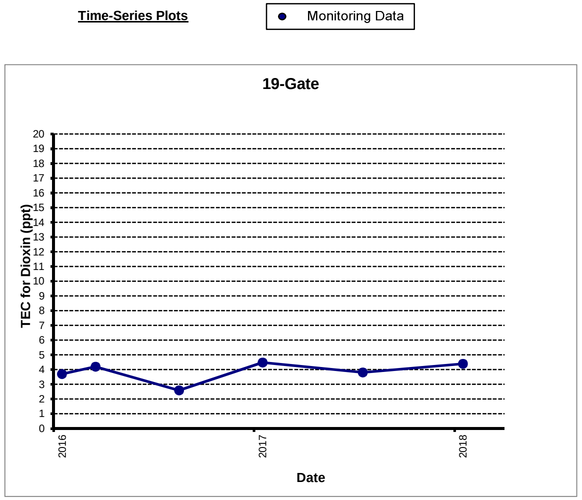
Although the Salzburg Landfill Soil Boxes have not exceeded their performance criteria, the concentration gradient across the monitoring locations suggest that the soil data is representative of actual air borne/track out conditions at the site. Soil box SLFSB-02 has the highest dioxin/furan concentrations compared to the other two monitoring locations, which would be expected by reason of its location on the exit route for trucks traveling through the active hazardous waste cells prior to the truck washing station. Soil box SLFSB-01 has the next highest dioxin/furan concentrations and is located at Gate 90, which is the entrance location for vehicles carrying waste and on the exit path for vehicles leaving the wash station. SLFSB-01 is also located at the main entrance and exit for all vehicles visiting the site. Finally, the upwind soil box, SLFSB-03, has the lowest concentration of dioxin/furan compounds, which would be expected since it is located upwind from the landfill and in an area that receives minute vehicle traffic. Given that the data are showing a concentration gradient representative of what would be expected, it can be concluded that the data is also an accurate representation of the ambient site conditions in the areas where the soil boxes are located.

The prevailing wind direction at the site is from the west southwest. The ambient air northeast of the active is monitored every six days for total suspended particulates (TSP) by ambient air monitoring station 261110917. Per the request of the Michigan Department of Environmental Quality (MDEQ), Dow committed to removing SLFSB-03 and adding a new soil box to a location downwind from the active waste cells and on the inside of the berm (reference Figure 2). Dow expects that monitoring at the new downwind location (SLF SB-04) will strengthen the existing Soil Monitoring Program and ensure ongoing effectiveness of the Plan. Soil Box -04, the new downwind locations, was built in 2016 and annual sampling was completed in 2017 and 2018. Soil data for Soil Box -04 is provided in Attachment B of this plan.

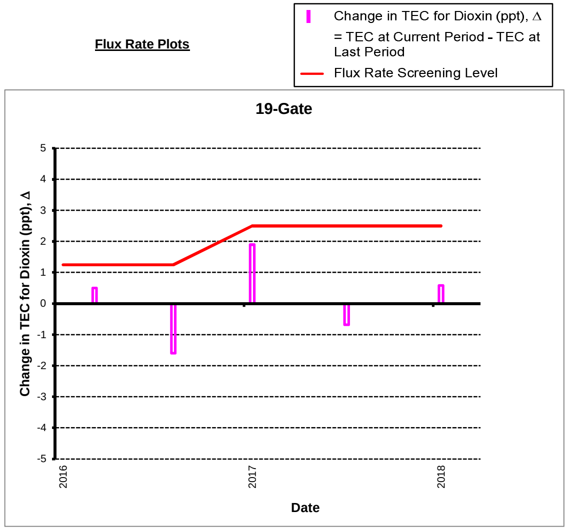
ATTACHMENT B

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary

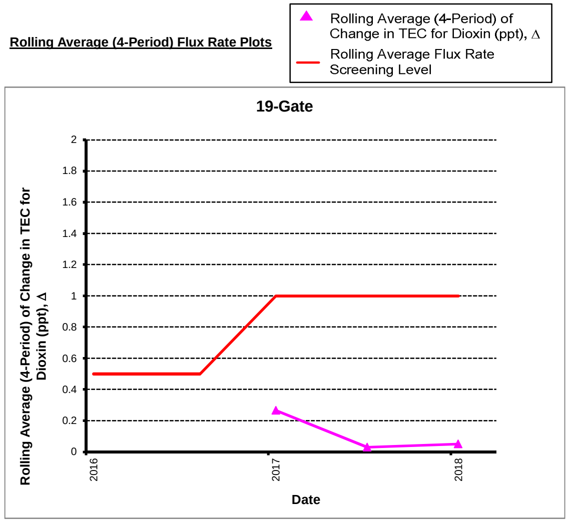
Time-Series Plots



Flux Rate Plots



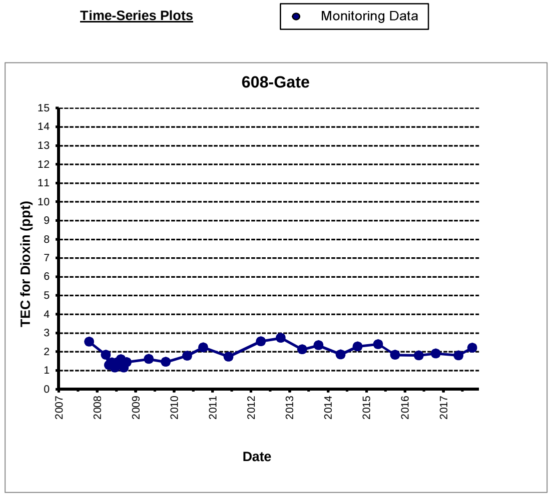
Rolling Average (4-Period) Flux Rate Plots



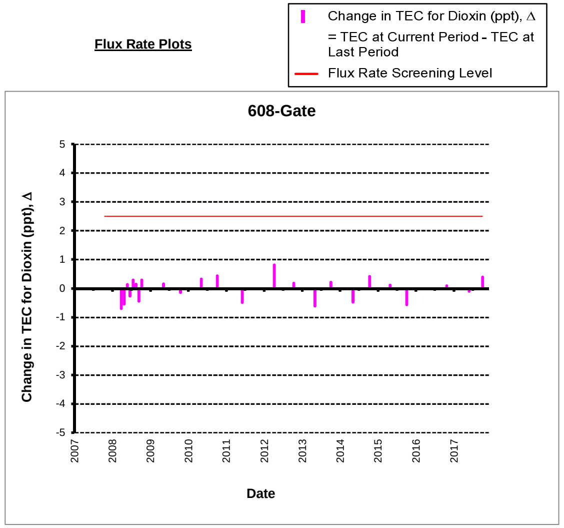
TEC = Toxic Equivalency Factor
ppt = part per trillion

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary

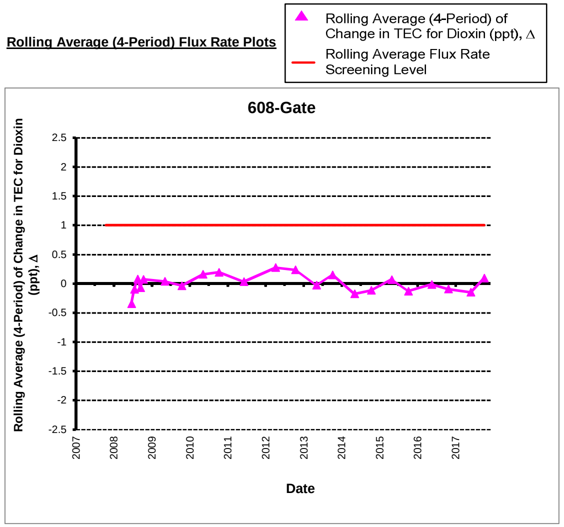
Time-Series Plots



Flux Rate Plots



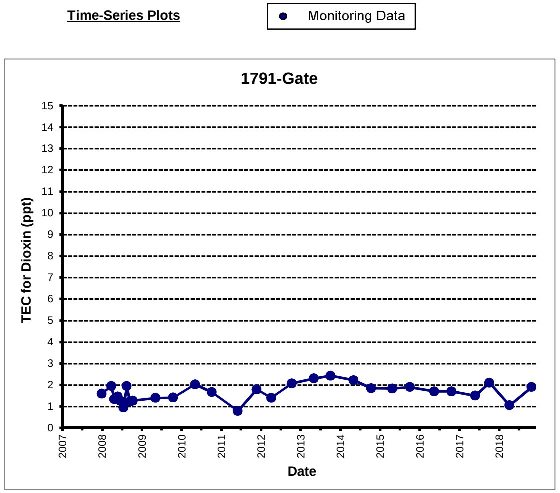
Rolling Average (4-Period) Flux Rate Plots



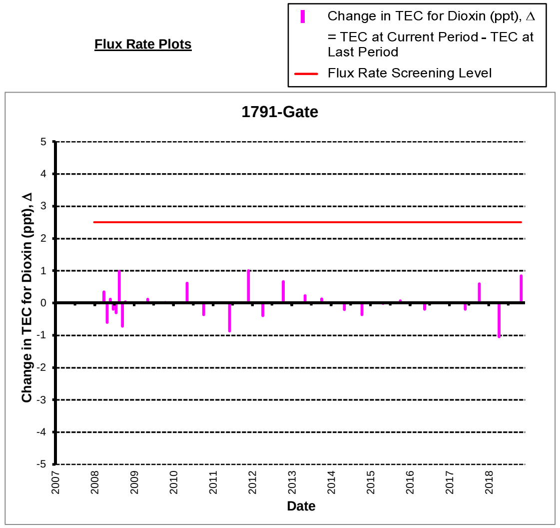
TEC = Toxic Equivalency Factor
ppt = part per trillion

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary

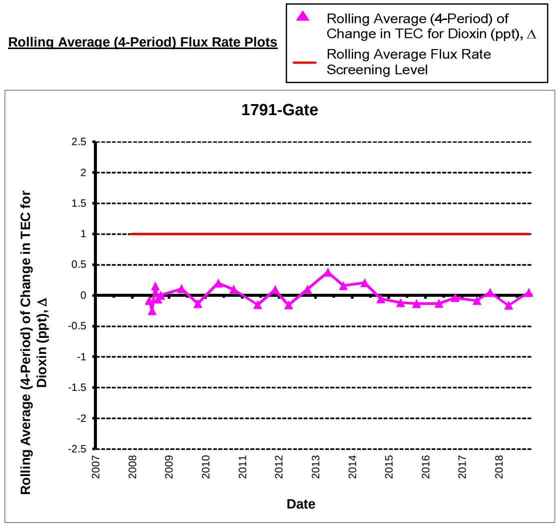
Time-Series Plots



Flux Rate Plots



Rolling Average (4-Period) Flux Rate Plots

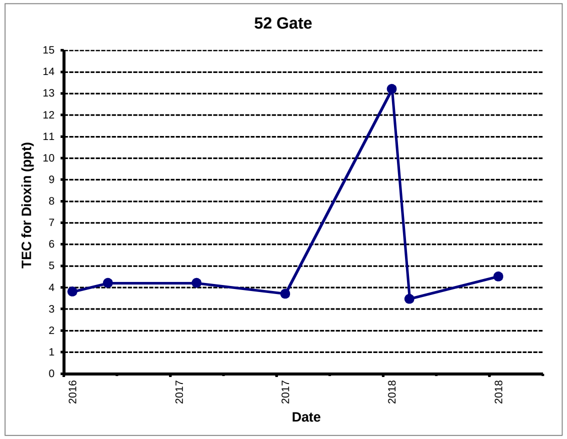


TEC = Toxic Equivalency Factor
ppt = part per trillion

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary

Time-Series Plots

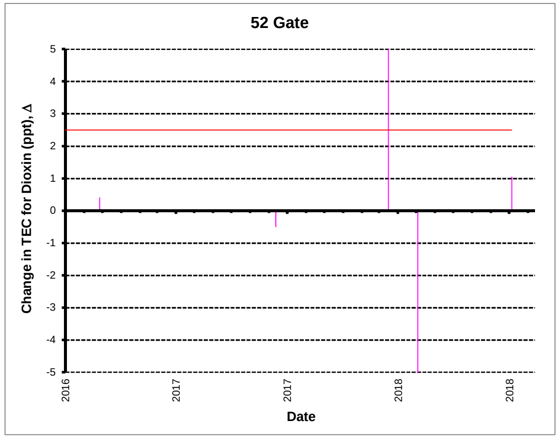
Monitoring Data



Flux Rate Plots

Change in TEC for Dioxin (ppt), Δ = TEC at Current Period - TEC at Last Period

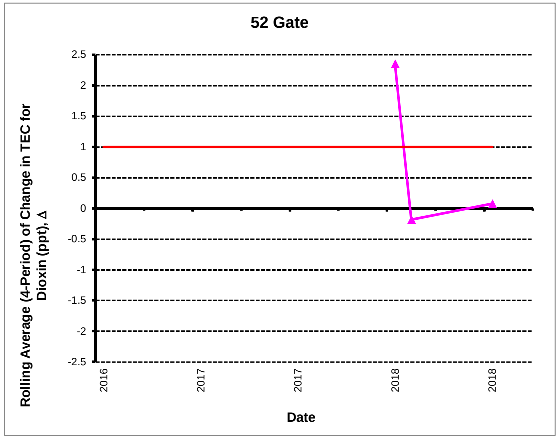
Flux Rate Screening Level



Rolling Average (4-Period) Flux Rate Plots

Rolling Average (4-Period) of Change in TEC for Dioxin (ppt), Δ

Rolling Average Flux Rate Screening Level

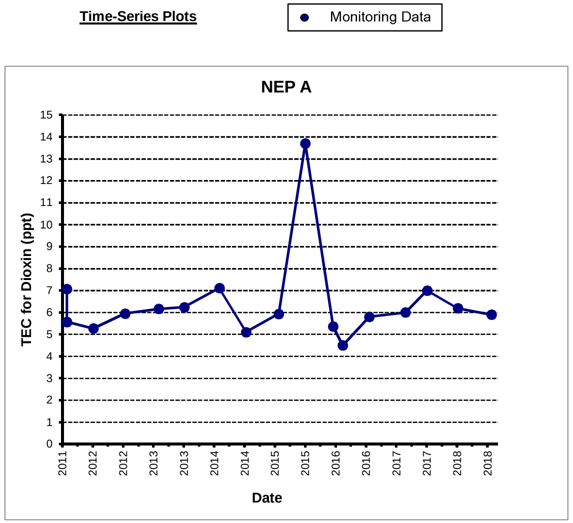


TEC = Toxic Equivalency Factor

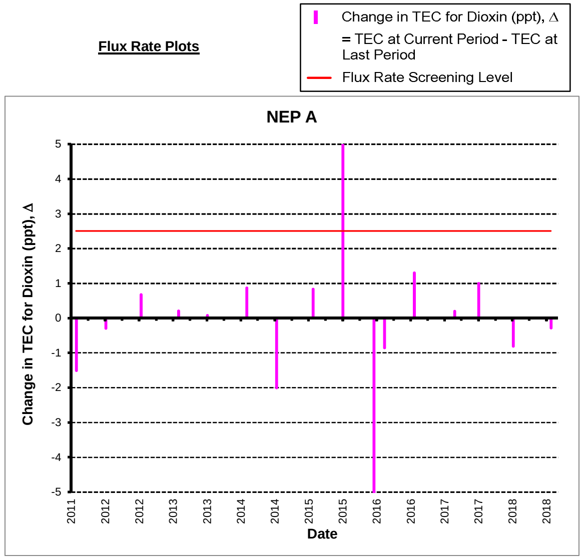
ppt = part per trillion

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary

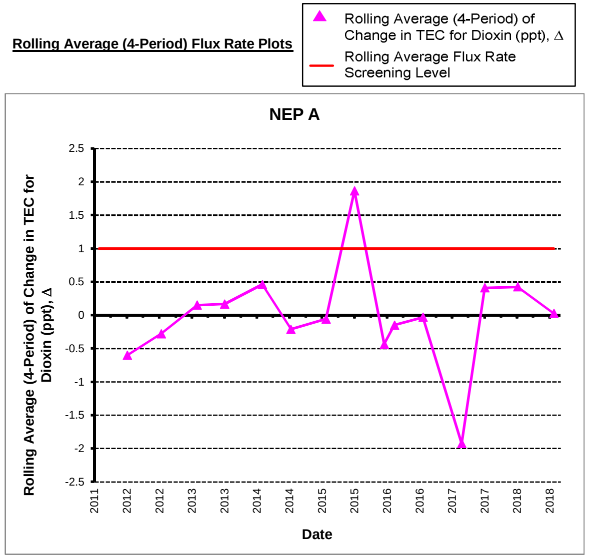
Time-Series Plots



Flux Rate Plots



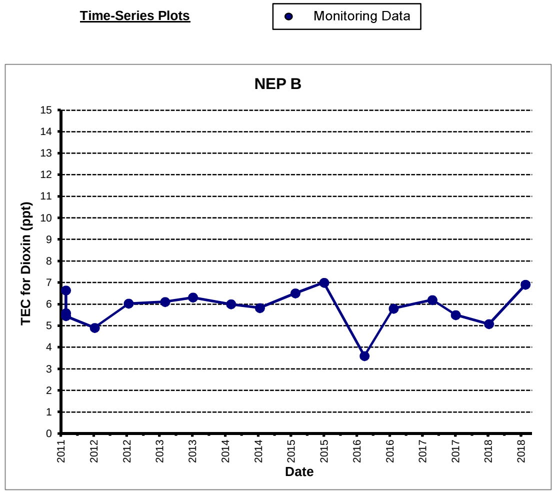
Rolling Average (4-Period) Flux Rate Plots



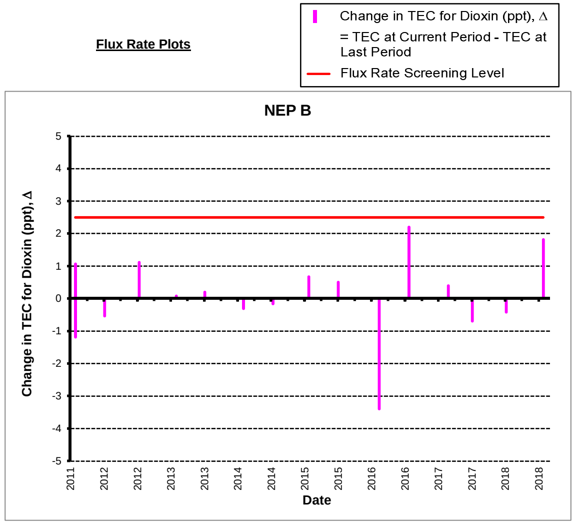
TEC = Toxic Equivalency Factor
ppt = part per trillion

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary

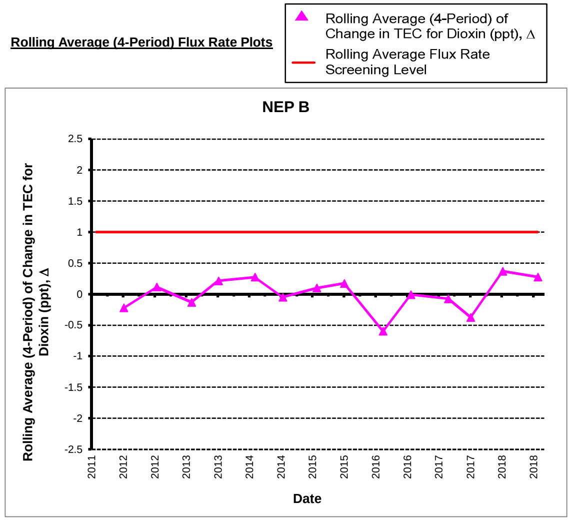
Time-Series Plots



Flux Rate Plots



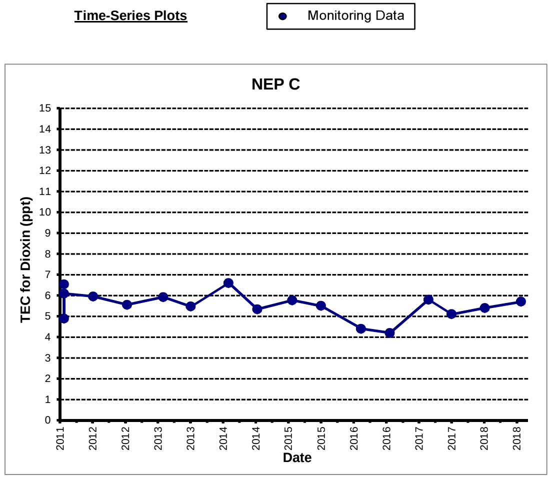
Rolling Average (4-Period) Flux Rate Plots



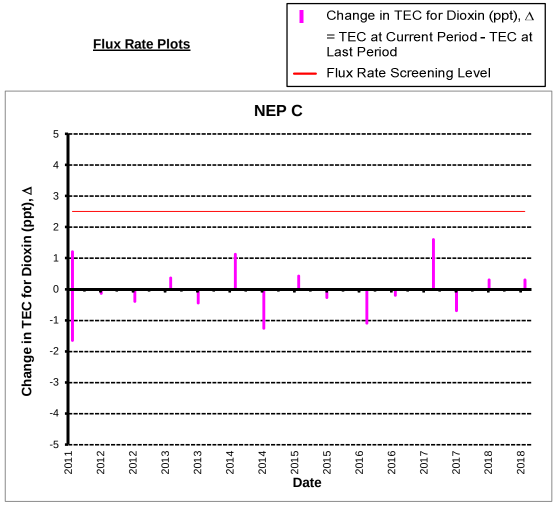
TEC = Toxic Equivalency Factor
ppt = part per trillion

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary

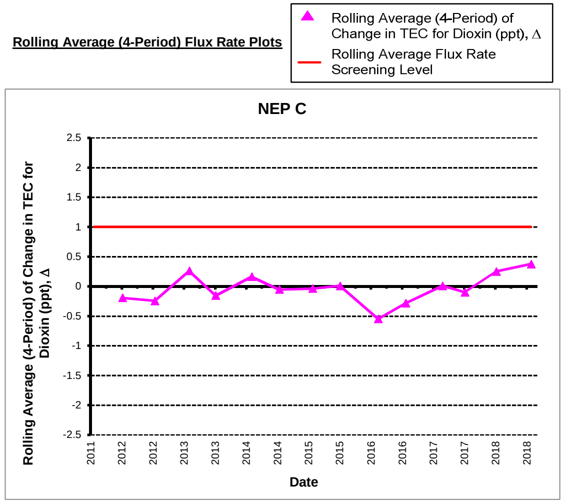
Time-Series Plots



Flux Rate Plots



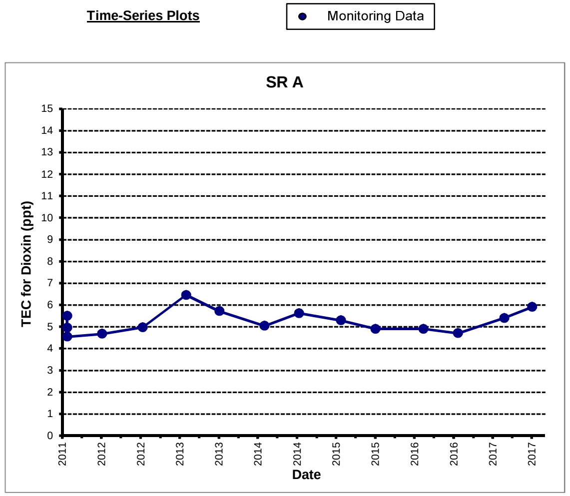
Rolling Average (4-Period) Flux Rate Plots



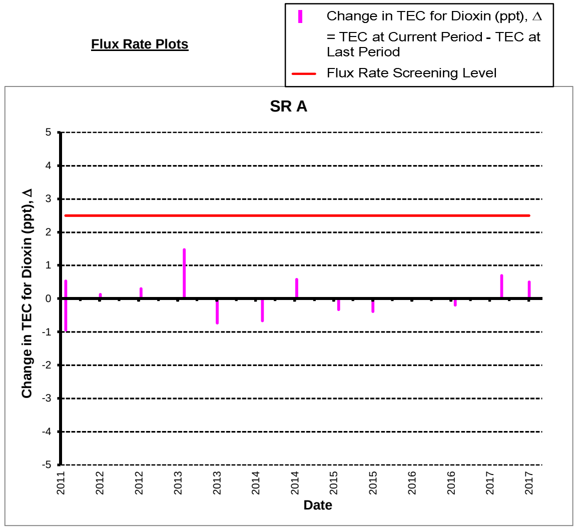
TEC = Toxic Equivalency Factor
ppt = part per trillion

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary

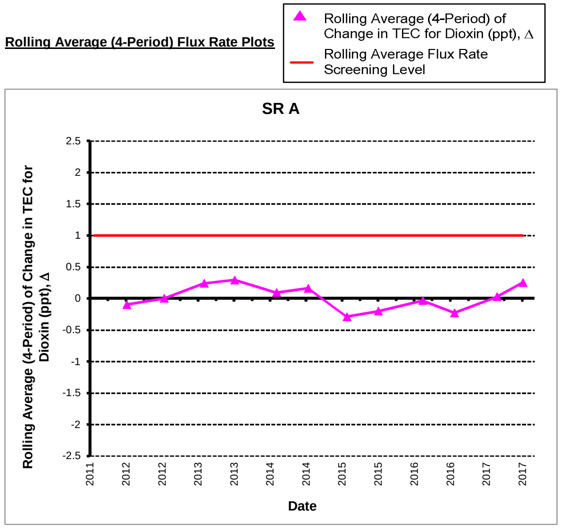
Time-Series Plots



Flux Rate Plots

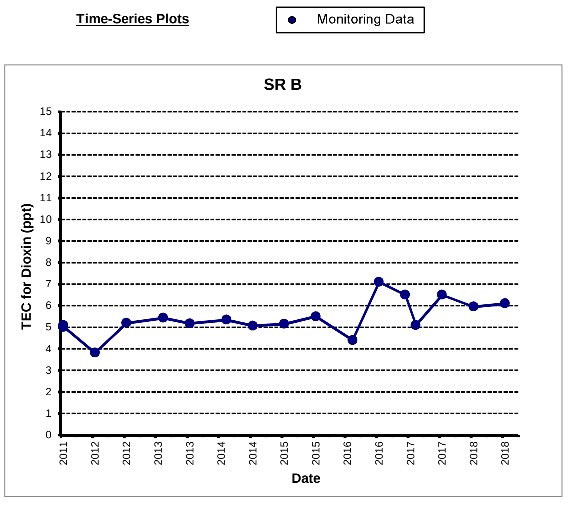


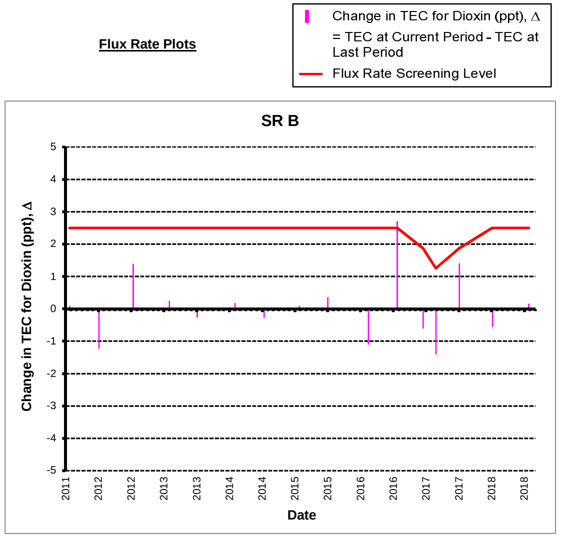
Rolling Average (4-Period) Flux Rate Plots

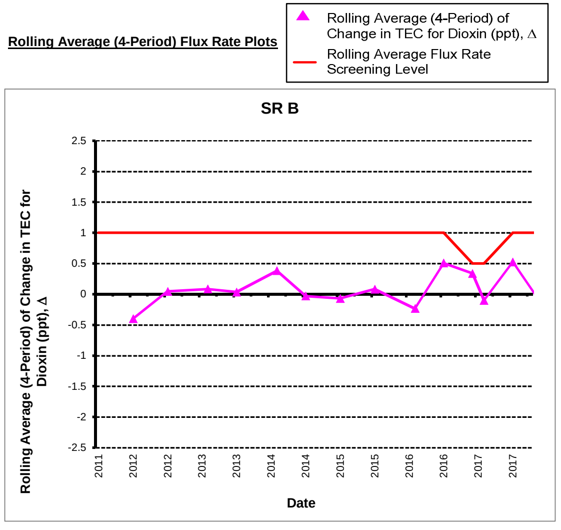


TEC = Toxic Equivalency Factor
ppt = part per trillion

Attachment B
Soil Box Data Evaluation
Midland Plant Soil Box Data Summary







TEC = Toxic Equivalency Factor
ppt = part per trillion

Appendix J - Performance Criteria Values

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
7th Street Purge Well Area Corrective Action Monitoring	MW-14S; MW-15S; and MW-17	1,1,1-Trichloroethane	89 ug/L	Cleanup Criteria (MDEQ Generic GSI Criteria R 299.5744)	Not Applicable
		1,1-Dichloroethene	130 ug/L		
		1,1-Dichloroethane	740 ug/L		
		1,2,4-Trimethylbenzene	17 ug/L		
		1,2-Dichlorobenzene	13 ug/L		
		1,2-Dichloropropane	230 ug/L (X)		
		1,3,5-Trimethylbenzene	45 ug/L		
		1,4-Dichlorobenzene	17 ug/L		
		Benzene	200 ug/L (X)		
		Bromodichloromethane	ID		
		Bromomethane	35		
		2-Butanone	2200 ug/L		
		Carbon Disulfide	ID		
		Chlorobenzene	25 ug/L		
		Chloroethane	1100 ug/L (X)		
		Chloromethane	ID		
		Cis-1,2-Dichloroethene	620 ug/L		
		Dichlorodifluoromethane	ID		
		Ethylbenzene	18 ug/L		
		Isopropylbenzene	28 ug/L		
		N-Propylbenzene	ID		
		Sec-Butylbenzene	ID		
		Tetrachloroethene	60 ug/L (X)		
		Tetrahydrofuran	11000 ug/L (X)		
		Toluene	270 ug/L		
		Trichloroethene	200 ug/L (X)		
		M-Xylene	41 ug/L		
		O-Xylene	41 ug/L		
		P-Xylene	41 ug/L		
		Vinyl Chloride	13 ug/L (X)		
		1-Methylnaphthalene	no GSI criterion		
		2-Methylnaphthalene	19 ug/L		
		Acenaphthene	38 ug/L		
		Anthracene	ID		
		Benzo(A)Pyrene	ID		
		Benzo(B)Fluoranthene	ID		
		Benzo(Ghi)Perylene	ID		
		Chrysene	ID		
		Fluoranthene	1.6 ug/L		
		Fluorene	12 ug/L		
		Naphthalene	11 ug/L		
		Phenanthrene	2.0 ug/L (M); 1.4 ug/L		
		Pyrene	ID		
		Cadmium	(G,X)		
		Chromium	11 ug/L		
		Lead	(G,X)		
		Arsenic	10 ug/L		
		Cyanide, Total	5.2 ug/L		
	MW- 18	Same list as above	Addressing under Corrective Action		

Appendix J - Performance Criteria Values

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
Ash Pond	all monitoring wells listed in Table 2-G	all VOAs on target list in Table 2-G	RL, see Appendix B	Background Value	Not Applicable
	6165	Arsenic	Addressing under Corrective Action		Updated to UPLs in January 30, 2019
		Boron	525 ug/L	UPL	
	6166	Arsenic	4.8 ug/L	UPL	
		Boron	1100 ug/L	UPL	
	6167	Arsenic	2.8 ug/L	UPL	
		Boron	355 ug/L	UPL	
	6168	Arsenic	3.78 ug/L	UPL	
		Boron	460 ug/L	UPL	
	6169	Arsenic	Addressing under Corrective Action		
		Boron	447 ug/L	UPL	

Appendix J - Performance Criteria Values

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
Former 47 Building	F47-MW-11 & F47-MW-12	Dichlorodifluoromethane	ID	Cleanup Criteria (MDEQ Generic GSI Criteria R 299.5744)	Not Applicable
		1,2-Dichloroethane	360 ug/L (X)		
		1,2-Dichloropropane	230 ug/L (X)		
		Tetrachloroethene	60 ug/L (X)		
Northeast Perimeter Corrective Action Monitoring	Corrective Action monitoring wells 5385, 6176, 6177, 4355, 4363	All Primary Constituents on target list in Corrective Action Monitoring section of Table 2-I	RL, see Appendix B	Background Value	Not Applicable
Northeast Perimeter Corrective Action Plum Sentinel Monitoring	MW-H & MW-10	1,1,1-Trichloroethane	89 ug/L	Cleanup Criteria (MDEQ Generic GSI Criteria R 299.5744)	Not Applicable
		1,1-Dichloroethane	130 ug/L		
		Chlorobenzene	25 ug/L		
		Cis-1,2-Dichloroethene	620 ug/L		
		Tetrachloroethene	60 ug/L (X)		
		Trichloroethene	200 ug/L (X)		
		Vinyl Chloride	13 ug/L (X)		
		Manganese	Reviewed for continuing natural attenuation	Ongoing natural attentuation indicators	
		Sodium			
		Zinc			
		Ammonia			
		Carbon dioxide			
		Chloride			
		Ethane			
		Ethene			
		Ferrous iron			
		Nitrate			
		Nitrite			
		Phosphorus			
		Sulfate			
		Sulfides			
		Total Organic Carbon			

Appendix J - Performance Criteria Values

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
West Plant Perimeter	all monitoring wells listed in Table 2-J	Carbon Tetrachloride	45 (X)	Cleanup Criteria (MDEQ Generic GSI Criteria R 299.5744)	Not Applicable
		Chloroform	350 ug/L		
Poseyville Landfill Leak Detection Chemical Monitoring	all monitoring wells in Table 2-N Leak Detection Chemical Monitoring	All Primary Constituents on target list in Table 2-N	RL, see Appendix B	Background Value	Not Applicable
Poseyville Landfill Corrective Action Chemical Monitoring	5925	Chloroform	RL, see Appendix B	Background Value	Not Applicable
		Ethylbenzene	RL, see Appendix B	Background Value	Not Applicable
		Benzene	680 ug/L	UPL	30-Jan-19
		Chlorobenzene	460 ug/L	UPL	
	6174	Benzene	77 ug/L	UPL	
		Chlorobenzene	23.5 ug/L	UPL	
		Chloroform	RL, see Appendix B	Background Value	Not Applicable
		Ethylbenzene	RL, see Appendix B	Background Value	Not Applicable
	All other Corrective Action monitoring wells listed in Table 2-N of the SAP	All Primary Constituents on target list in Corrective Action Table 2-N	RL, see Appendix B	Background Value	Not Applicable
Tertiary Pond Recovery Monitoring	3795	Benzene	4.3 ug/L	UPL	Submitted January 30, 2019
		Chlorobenzene	8.14 ug/L	UPL	
Ambient Air Monitoring Program	AQS #261110960 AQS #261110961 AQS #261110953 AQS #261110959 AQS #261110955	1,1,1,2-Tetrachloroethane	10 ug/m3	See Appendix L	January, 2019
		1,1,2-Trichloroethane	6 ug/m3		
		1,2-Dichloroethane	4 ug/m3		
		1,1,2,2-Tetrachloroethane	2 ug/m3		
		Acrylonitrile	6 ug/m3		
		Benzene	30ug/m3		
		Chloroform	40 ug/m3		
		1,4 dichlorobenzene	2400 ug/m3		
		Styrene	3000 ug/m3		
		Trichloroethylene	2 ug/m3		
		Total Suspended Particulates (TSP)	150 ug/m3 and 50 ug/m3 annual average		
	AQS #26111914 AQS #26111917 AQS #26111918	Total Suspended Particulates (TSP)	150 ug/m3 and 50 ug/m3 annual average		

Appendix J - Performance Criteria Values

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
Overlook Park Groundwater Monitoring Program	8915	Iron	67.4 ug/L	UPL	January, 2019
		Magnesium Manganese Sodium Sulfate Chloride	insufficient background data at this time due to outlier(s)		
Salzburg Landfill Leak Detection System	All Cells	VOA and EOA	RL identified in Appendix B	RL	Not Applicable
	Cells 3-5 LS 3A	Copper Cobalt Selenium Vanadium Cyanide	2.1 ug/L RL RL RL RL	UPL	
	Cells 6-8 LS 6	Copper Cobalt Selenium Vanadium Cyanide	3.1 ug/L RL RL RL RL	UPL	
	Cells 9-10 LS 8	Copper Cobalt Selenium Vanadium Cyanide	3.5 ug/L RL RL RL RL	UPL	
	Cells 11-12 LS 11	Copper Cobalt Selenium Vanadium Cyanide	2.34 ug/L RL RL RL RL	UPL	
	Cells 13-14 LS 12	Copper Cobalt Selenium Vanadium Cyanide	7.8 ug/L RL RL RL RL	UPL	
	Cells 15-16 LS 20	Copper Cobalt Selenium Vanadium Cyanide	9.1 ug/L RL RL RL RL	UPL	
	Cells 17-19 LS 21	Copper Cobalt Selenium Vanadium Cyanide	4.68 ug/L RL 2.4 ug/L RL RL	UPL	
	Cells 20-22 Cleanout	Copper Cobalt Selenium Vanadium Cyanide	6.61 ug/L RL 19 ug/L RL RL	UPL	
	Cells 23-26 LS 28	Copper Cobalt Selenium Vanadium Cyanide	29 ug/L RL 4.1 ug/L 2.7 ug/L RL	UPL	

Appendix J - Performance Criteria Values

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
Glacial Till and Regional Aquifer Groundwater Monitoring	All GTRA Wells including SLF Till Wells	VOA and EOA	RL identified in Appendix B	RL	Not Applicable
	All GTRA Wells	chloride, carbonate alkalinity(CO3), bicarbonate alkalinity, sulfate (SO4), calcium, magnesium, potassium, sodium, iron	Statistically significant increases will be recognized by at least three consecutive quarterly temporal diagrams showing the same sequential pattern, or long term change in concentration defined by a consistent 25% or more increase per monitoring period for two years for any Tracking Parameter	Tracking Parameter/Trend Evaluation	January, 2019
Salzburg Landfill Groundwater Monitoring	All SLF Till Wells	chloride, carbonate alkalinity(CO3), bicarbonate alkalinity, sulfate (SO4), calcium, magnesium, potassium, sodium, iron Total Organic Carbon	Requires summary of trends in annual monitoring report.	Tracking Parameter/Trend Evaluation	Not Applicable
	4829	Copper Cobalt Selenium Vanadium Cyanide	10 ug/L 7 ug/L RL RL RL	UPL	January, 2019
	4830	Copper Cobalt Selenium Vanadium Cyanide	12.2 ug/L RL RL RL RL	UPL	January, 2019
	4831	Copper Cobalt Selenium Vanadium Cyanide	44 ug/L RL RL RL RL	UPL	January, 2019
	4832	Copper Cobalt Selenium Vanadium Cyanide	13 ug/L RL RL RL RL	UPL	January, 2019
	4833	Copper Cobalt Selenium Vanadium Cyanide	13.8 ug/L RL RL RL RL	UPL	January, 2019
	4834	Copper Cobalt Selenium Vanadium Cyanide	10 ug/L RL RL RL RL	UPL	January, 2019
	4836	Copper Cobalt Selenium Vanadium Cyanide	7.3 ug/L RL RL RL RL	UPL	January, 2019

Appendix J - Performance Criteria Values

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
Salzburg Landfill Groundwater Monitoring (continued)	4837	Copper	9 ug/L	UPL	January, 2019
		Cobalt	RL		
		Selenium	RL		
		Vanadium	RL		
		Cyanide	RL		
	4838	Copper	7	UPL	January, 2019
		Cobalt	RL		
		Selenium	RL		
		Vanadium	RL		
		Cyanide	RL		
	4839	Copper	10	UPL	January, 2019
		Cobalt	RL		
		Selenium	RL		
		Vanadium	RL		
		Cyanide	RL		
	4840	Copper	6.8	UPL	January, 2019
		Cobalt	10		
		Selenium	RL		
		Vanadium	RL		
		Cyanide	RL		
	5949	Copper	1.4 ug/L	UPL	January, 2019
		Cobalt	RL		
		Selenium	RL		
		Vanadium	RL		
		Cyanide	RL		
	5780	Copper	2.6 ug/L	UPL	January, 2019
		Cobalt	RL		
		Selenium	RL		
		Vanadium	RL		
		Cyanide	RL		
	4666	Copper	5.6 ug/L	UPL	January, 2019
		Cobalt	22 ug/L		
		Selenium	RL		
		Vanadium	RL		
		Cyanide	RL		
	4667	Copper	4.2 ug/L	UPL	January, 2019
		Cobalt	RL		
		Selenium	RL		
		Vanadium	RL		
		Cyanide	RL		
	5213	Copper	10 ug/L	UPL	January, 2019
		Cobalt	14 ug/L		
		Selenium	RL		
		Vanadium	3 ug/L		
		Cyanide	RL		
	5594	Copper	2.19 ug/L	UPL	January, 2019
		Cobalt	14 ug/L		
		Selenium	RL		
		Vanadium	6		
		Cyanide	RL		

Appendix J - Performance Criteria Values

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
Soil Box Monitoring	608-Gate 1791-Gate 52-Gate 19-Gate NEP-A NEP-B NEP-C SR-A SR-B	Dioxins and Furans (WHO-TEC)	2.5/1.0 ppt TEC	Flux screening criteria/rolling average	See the Soil Box Data Evaluation Plan
	SLF SB-01 SLF SB-02 SLF SB-04		2.5/1.0 ppt TEC		

Program	Well(s)	Compound	Performance Criteria Value	Type	Background Dataset Submitted
Surface Water Monitoring	001-B	Cobalt Copper Cyanide Selenium Vanadium TOC	RL 12 ug/L 7.3 ug/L 3.4 ug/L 23.5 ug/L 24000 ug/L	UPL	UPLs established January 30, 2019
	001-D	Cobalt Copper Cyanide Selenium Vanadium TOC	5.4 ug/L 12 ug/L 4.4 ug/L 4.6 ug/L 22.3 ug/L 25000 ug/L	UPL	
	001-E	Cobalt Copper Cyanide Selenium Vanadium TOC	12 ug/L 13 ug/L 6.2 ug/L 2.6 ug/L 12.7 ug/L 21000 ug/L	UPL	

Summary of applicable footnotes and abbreviations (for complete footnote, see DEQ, RRD, Operational Memorandum No. 1: *Footnotes for Part*

ID = insufficient data to develop criteria

G = GSI criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for protection of aquatic life

M = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.

X = The GSI criterion shown in the generic cleanup criteria tables is not protecive for surface water that is used as a drinking water source.

CC = Groundwater: The generic GSI criteria are based on the toxicity of unionized ammonia (NH3); the criteria are 29 ug/L and 53 ug/L for cold ater and

EE = Applicable generic GSI criteria as required by Section 20120a(15) of NREPA.

UPL = Upper prediction limit

UTL = Upper tolerance limit

RL = Reporting limit

APPENDIX K

Well Abandonment and Replacement Specification
The Dow Chemical Company
Michigan Operations, Midland Plant and Salzburg Landfill Facility

Section 1 APPLICABILITY

This specification is in accordance with ASTM D5092 Stand Practice for Design and Installation of Monitoring Wells and ASTM D5299 Decommissioning of Groundwater Wells. This specification applies to replacement of existing wells that have been damaged or rendered inoperable. Replacement of historic wells that were installed using materials of construction or design details that do not confirm with current agency guidance and regulations (galvanized steel, screen lengths over 10 feet for monitoring wells, etc.), will be completed in accordance with the design included in this specification. Upgrading of the replacement well design in accordance with this specification is considered functionally equivalent to the damaged or inoperable well provided the well is screened at the same depth within the relevant formation, and located within 15 feet radially of the damaged or inoperable well it is replacing. Prior notification must be given to MDEQ in accordance with License Condition X.B.1.(g)(i). Upon replacement, the SAP shall be modified as identified in License Condition X.A.2.(c).

This specification does not apply to replacement or relocation of existing functional wells to allow for facility expansion, construction, or otherwise facilitate unrelated work. Such a change must be submitted to MDEQ for prior approval. Upon approval and installation, the SAP and License shall be updated as identified in the table in License Condition X.A.2.(b).

Section 2 BOREHOLE GROUTING

Section 2.1 GENERAL

- This specification describes materials, workmanship, and procedures required to supply and place grout in all drilled excavations including, but not limited to, soil borings, cathodic protection wells, and groundwater wells.
- In addition to drilled boreholes, cone penetrometer test holes shall also be filled according to this specification.
- Materials and procedures shall be as described in this specification. Exceptions to this specification are noted in the design drawings and details.

Section 2.2 MATERIALS

- Grout for boreholes shall:
    - Be a single component mixture with a permeability of less than or equal to 1x10-7 cm/sec in fresh water.
    - Be contaminant free, chemically stable, physically stable, and will not flow through highly permeable soils.
    - Conform with the special provisions in Section 2.3.2 of this specification.
- Grout shall be selected based on the following:
    - Grout mixture for shallow and deep application shall be mixed to be between 15-25% solid.
    - Pelletized, chipped or powdered bentonite shall be used for shallow boreholes only (<15 feet deep).
- Mixing water shall be potable, have less than 100 ppm chloride and less than 100 mg/l calcium.

Section 2.3 FIELD PROCEDURES

- All boreholes and cone penetrometer test holes shall be filled upon completion of work.
- Grout shall be mixed and installed according to the manufacturer's written instructions, API Specification 10, or ASTM C 150, as applicable.
- The lower end of grout pipe (tremie pipe) shall be cut at an angle to allow for the side discharge of the grout.
- Drilled excavations and test holes shall be filled for their full depth to be level with surrounding existing grade.
- Pump grout in a continuous operation using a tremie pipe until thick, undiluted grout appears at the surface. The tremie shall reach to the full depth of the grout and grouting shall be done from the bottom up. The tremie pipe may be raised during grouting of deep boreholes to avoid excessive pumping pressure, but shall always remain 10 feet below the grout surface.
- Top off grout after initial settlement using a material from the same company as grout sealant to form a permanent, downhole seal. The grout sealant shall have the same general requirements as noted above. The topping off grout sealant shall be poured slowly into hole to prevent bridging or binding and per the manufacturer's recommendations.
- After 24 hours, repeat Section 2.3 as required or fill in any remaining hole with native soil and remove spoil from surrounding area.

Section 2.3.1 Shallow Boreholes

- Shallow boreholes, i.e., less than 15 feet deep, may be filled with dry bentonite chip or pellets, except as prohibited by Section 2.3.2 of this specification.
- Check that borehole remains open to drilled depth if not being filled through drill tooling.
- Tamp or rod while filling to compact pellets and prevent bridging in the hole.

Section 2.3.2 SPECIAL APPLICATIONS

- Conditions requiring moderate to high sulfate resistance shall use American Petroleum Institute (API) Class B Neat Cement.
- In the presence of moderate to elevated brines (identifiable by chloride >1,500 mg/L or hardness over 500 mg/L), bentonite powder, chip or pellets shall not be used. Conditions requiring moderate to high chloride resistance (in the presence of brines) shall use API Class A Neat Cement, with Baroid IDP Polymer.
- In the presence of dense or light non-aqueous phase liquids (LNAPLs or DNAPLs), bentonite powder chip or pellets shall not be used as oils coat the grains and prevent hydration. Use API Class A Neat Cement with Baroid IDP Polymer.

Section 3 STANDARD WELL DESIGN

Section 3.1 GENERAL

- Well installation methods shall comply with ASTM D 5092 (R 299.9506(2)(b)).
- Traffic protection (bollards) shall be provided for new wells.
- Attached Drawing 1 presents the standardized well design.

Section 3.2 MATERIALS

Section 3.2.1 Filter Pack

- Washed uniformly graded silica sand shall be used as a default filter material.
- Custom-graded filters are allowed, provided they are designed in conjunction with a well screen, and must consider grading of the aquifer.
- Any filter media must be low-carbonate and chemically inert to allow for possible future acid cleaning.

Section 3.2.2 Well Screens

- Well screens shall have the same inside diameter as the well riser pipe.
- Stainless steel well screen must be the same type of stainless steel as the riser pipe.
- Well screens must tightly seal with a threaded or welded connection to the riser pipe.
- PVC or stainless steel screens may be utilized.
- Screen materials shall be selected to sustain heat of hydration of grout selected for each application and must have a crush strength that exceeds the ground pressure (to prevent screen collapse).
- Pre-pack screens may be used provided the filter materials conform with Section 3.2.1 of this specification.
- Well screens shall be free from contaminants.

Section 3.2.3 Well Risers

- Riser materials shall be selected to sustain heat of hydration of grout selected for each application and must have a crush strength that exceeds the ground pressure (to prevent riser collapse).
- Well riser shall be the same diameter of the well screens.
- Stainless steel well riser must be the same type of stainless steel as the well screen.
- Well riser must tightly seal with a threaded or welded connection to the well screen.
- PVC or stainless steel well riser may be utilized.
- Well riser shall be free from contaminants.

Section 3.2.4 Above-grade Well Riser Protection

- Above-grade well protectors must be lockable.
- Provisions must be in place to drain moisture from the above-grade annulus.
- Protectors must be secured in place per Detail A on Drawing 1 (attached).

Section 3.2.5 Flush-grade Well Protection

- Well protection manholes shall be secured in place per Detail B on Drawing 1 (attached).

Section 3.2.6 Bollards

- Bollards shall include 4" steel posts, filled with cement or concrete.
- Bollards must be embedded for 75% of the total length.

Section 3.3 INSTALLATIONS AND WORKMANSHIP

- Soil boring equipment, tooling and materials should be steam-cleaned prior to use at the site.
- Final installation shall be in accordance with Drawing 1 (attached), using either a stick-up protector (Section 3.2.4) or a flush-grade well protector (Section 3.2.5).

Section 3.3.1 Glacial Aquifer Groundwater Monitoring Well

- Wash water, drilling water, or water for drilling mud shall be obtained from the Regional Aquifer.
- Only bio-degradable lubricants shall be used on augers, rods or downhole tooling.
- Open boreholes should not be left overnight (if augers, rods or casings are withdrawn from a borehole that may allow shallow contaminants to progress to a lower aquifer); boreholes shall be grouted that same day.
- A filter pack shall be installed around the well screen (see Drawing 1, attached).
- An annular seal composed of coated bentonite pellets or fine sand shall be place above the filter pack to prevent grout intrusion into the filter.
- Grout entire annular space between the boring wall and the casing wall, from the top of the annular seal to ground surface, in accordance with Section 2.

Section 3.3.2 Shallow Monitoring Well

- Wash water, drilling water or water for drilling mud shall be potable.
- Using grout (selected according to Section 2), fill entire annular space between the boring wall and the casing wall, from the top of the annular seal to ground surface, in accordance with Section 2.

Section 3.4 DOCUMENTATION

- A well installation log shall be completed by a field geologist
- The well installation log will note:
  - The borehole depth
  - The bottom of screen
  - The length of screen
  - The material of screen construction
  - The amount of riser pipe
  - The material of screen construction
  - The filter material
  - The top of filter
  - The grout and/or seal material
  - The bottom of filter
  - Soil descriptions (and source of descriptions – e.g., field observation)
  - Location of descriptions of any soil samples collected
  - Surface completion
  - Date of installation

Section 4 STANDARD WELL ABANDONMENT

Section 4.1 GENERAL

Well abandonment methods shall comply with ASTM D 5299 (R 299.9506(2)(b)).

Attached Drawing 2 presents standardized well abandonment practice.

Section 4.2 MATERIALS

All materials shall be consistent with Section 2.2.

Section 4.3 ABANDONMENT

Section 4.3.1 Records Review

- Review all available records and information relating to use and/or prior installation of the well, including drilling method, lithology, developing and/or sampling logs, and repair records.
- When closing or removing monitoring wells, extraction wells or geophysical wells, an attempt must be made to determine the diameter of the equipment used to install them so holes may be filled to the same diameter as the original installation borehole.

Section 4.3.2 Verification of Field Data

The well shall be inspected prior to closure to verify the field situation and/or measurements, including the wellhead integrity, the presence of pumps or additional surface casings and the currently measured depth, and grout settling.

Section 4.4 FIELD PROCEDURES

- The geologist or engineer shall be on-site during well abandonment.
- Remove any pumps or dedicated sampling equipment from the well.
- Remove casing from the ground by either pulling or overdrilling (see Detail A, Drawing 2). If annulus does not stay intact when pulling a casing, the borehole shall be over-drilled.
- Depending on the construction, it may be necessary to leave the casing in place (see Detail B, Drawing 2).
- Where removal of the casing is not possible or required, cut the well off 12 inches below finished ground elevation.

- Determine the volume of the borehole (or casing) by:

  $V=\pi r^2 L$

  Where:

  V = Volume

  L = length of the borehole or well to be plugged

  R = radius of the hole

  This volume is the minimum required for actual conditions due to possible loss of plugging material into the formation.

- Grouting shall proceed in accordance with Section 2.3.

Section 4.4.1 Abandoning Glacial Aquifer Groundwater Monitoring Well

- The geologist or engineer shall be on-site during well abandonment.
- Remove casing from the ground by either pulling or overdrilling (see Detail A, Drawing 2).
- Depending on the construction, it may be necessary to leave the casing in place (see Detail B, Drawing 2).
- Where removal of the casing is not possible or required, cut the well off 12 inches below finished ground elevation.
- The entire ungrouted annulus/remaining casing shall be grouted, in accordance with Section 2.
- Wash water, drilling water, or water for drilling mud may be obtained from the Regional Aquifer, or be potable (if potable water is used, it shall have less than 100 ppm chloride and less than 100 mg/l calcium).
- Only bio-degradable lubricants shall be used on augers, rods or downhole tooling.
- Open boreholes should not be left overnight (if augers, rods or casings are withdrawn from a borehole that may allow shallow contaminants to progress to a lower aquifer); boreholes shall be grouted that same day.

Section 4.4.2 Abandoning Shallow Wells

- The geologist or engineer shall be on-site during well abandonment.
- Remove casing from the ground by either pulling or overdrilling (see Detail A, Drawing 2).
- Depending on the construction, it may be necessary to leave the casing in place (see Detail B, Drawing 2).
- Where removal of the casing is not possible or required, cut the well off 12 inches below finished ground elevation.
- Ungrouted annulus/remaining casing shall be filled with dry pelletized, chipped or powdered bentonite.

- The bentonite pellets shall be tamped or rodded while filling to compact pellets and prevent bridging in the hole.

Section 4.5 DOCUMENTATION

- The well abandonment log will note:
  - The borehole depth.
  - The bottom of screen.
  - The length of screen.
  - Type and quantities of materials pulled.
  - Type and materials of grout pumped into the borehole.
  - Note quantities and configuration of any casing left in place.
  - Date of abandonment.

Appendix L

Ambient Air Monitoring Program
Basis and Quality Assurance

AMBIENT AIR MONITORING PROGRAM
BASIS AND QUALITY ASSURANCE

Overview and Objectives of the Program
The primary objective of this Ambient Air Monitoring Program is to characterize the emissions from The Dow Chemical Company, Midland Plant and Salzburg Landfill management of hazardous wastes and its impact on Midland's ambient air. Other objectives are to:

- Provide a basis for setting priorities for voluntary emission reduction projects;
- Compare trends in air emission rates with measured and predicted ambient air concentrations;
- Fulfill the regulatory requirements of the Hazardous Waste Management Facility Operating License, and;
- Demonstrate compliance with National Ambient Air Quality Standards (NAAQS) for TSP/PM-10. Note: If TSP results meet the PM-10 limits, Dow will be in compliance since PM-10 is a subset of TSP.

The airborne parameters to be monitored are outlined in Table 2-W of the Midland Plant and Salzburg Landfill Sampling and Analysis Plan (SAP).

Parameters, Methods and Sampling Frequencies
Samples shall be obtained according to the location, frequency, parameters, target goals for quantifying these compounds and analytical requirements as specified in Table 1 and Table 2-W of the SAP. The criteria for selecting these compounds are summarized in Table L-1, with supporting data provided in Table L-2.

Hourly meteorological data for the Midland area will be collected at 3600 Building, Salzburg Landfill, each day. The location of this station is shown in Figure 21. Volumes of air sampled will be corrected to EPA Standard Conditions (25°C, 760 mm Hg) through use of average daily temperatures and pressures, collected as described below.

Meteorological Data
Meteorological data are gathered from a meteorological measurement station located at 3600 Building, Salzburg Landfill. The wind speed and direction is collected using a wind monitor sensitive to ±0.3 m/s changes in wind speed (range of 0-100 m/s) and ±3° changes in wind direction. Temperature (to 0.1°C +0.15°C), relative humidity (to 0.1% ±2%), and barometric pressure (to 0.1 in Hg +0.08 in Hg) are also measured at the Salzburg Landfill meteorological measurement station. The following meteorological data will be collected in accordance with EPA guidance:*

1. Mean Horizontal Velocity (mean and standard deviation)
2. Mean Wind Direction (mean and standard deviation)
3. Temperature (high and low)
4. Wind Stability Class
5. Relative Humidity

A spreadsheet of these data with date, time, and weather parameters will be retained on-site and made available for review upon request. These data will be used to assign "upwind" and "downwind" sampling stations relative to the 32 Incinerator Complex and WWTP.
* "Quality Assurance Handbook for Air Pollution Measurement Systems," EPA 600/4-82-060, March 24, 2008 Revision.

Location and Description of Sample Collection Sites
Figure 21 of the SAP shows the location of the monitoring stations around Dow's Midland Plant and Salzburg Landfill sites, and the one monitoring station located off-site. All sites represent off-site ambient air. Sampling equipment will be located at a height of three to ten meters.
Site 1E/1W is a co-located site in the northeast corner of the Midland Plant site, and is aligned with the maximum off-site annual average ground level concentration of emissions from the Dow 32 Incinerator.

Sites 3 and 5A are located near the fence-line east, and south of the Midland Plant site. Site 3 is located about 100 meters south of Midland Plant site Gate 52 on Saginaw Road, and northeast of the Midland Plant site wastewater treatment plant (WWTP), which is approximately downwind of the prevailing wind direction from the WWTP. Site 5A is located south of the WWTP, near the Tittabawassee River at the location of maximum "off-site" 24-hour concentration from the WWTP emissions. Site 4A is located on Steward Road east of Homer Road, which is upwind (prevailing) from the Midland Plant site.

The three sites at Salzburg Landfill include station located on the easternmost perimeter of the landfill, inside the fenceline south of the #93 gate. A second station is located along the north perimeter of the landfill inside the fenceline and is closest to the current active hazardous waste cells. The third station is located on the southwestern perimeter of the landfill inside the fenceline and is closest to the capped non-hazardous waste cells. This station is also located in relatively close proximity to the daily cover storage piles and to the CSX Railway.

Midland Plant Site Number & Location	**AQS Number**
Sites 1E & 1W - Dow Michigan Operations co-located site	261110960 and 261110961
Site 3 - 3900 S. Saginaw Road	261110953
Site 4A - Stewart Road; Dow Brinewell Site 22P	261110959
Site 5A – Dow Michigan Operations WWTP	261110955

Salzburg Landfill Site Number & Location	**AQS Number**
Eastern perimeter of the landfill inside the fenceline	26111914
Along the north perimeter of the Landfill inside the fenceline, closest to the current active hazardous waste cells	26111917
Southwestern perimeter of the landfill, inside the fenceline	26111918

Criteria for Revising

Dow may submit proposed revisions to the monitoring parameters or sampling frequency, in accordance with Condition IX.2. Supporting data will be submitted with any requests to change AAMP–Analytes.

Dow will review the organic compound list using data obtained during the previous three years, beginning with an evaluation in 2018 of results through the end of 2017. Adjustments to the program will be proposed to direct the resources of this program on the most meaningful set of parameters. This will be accomplished by using calculated air emissions from the Midland Plant site's management of hazardous wastes over the latest available three year period. An organic compound will be included in the evaluation if it is one of the EPA' s Method TO-15 Volatile Organic Compounds and calculated air emissions during that time frame meet either of the following criteria:

- The organic compound has a ratio that is greater than or equal to 100 using the highest total calculated annual air emissions (lbs) over the three year period / MDEQ screening level (ITSL/SRSL value; ug/m^3) ; or
- The organic compound is a regulated chemical under 29 CFR Part 1910 – Occupational Safety and Health Standards, Subpart Z - Toxic and Hazardous Substances and the ratio of the highest total calculated annual air emissions (lbs) over the three year period / the lowest available occupational exposure level (OEL; ug/m^3) is greater than or equal to 1.

The organic compound list can be further refined by any of the following means:

- The organic compound is requested by MDEQ to be included and there is a readily available analytical method for measuring the organic compound in ambient air samples;
- The organic compound may be excluded if there are previous AAMP monitoring results demonstrating that the organic compound has met human health screening levels at similar or higher emissions levels that is representative of current operations and there is:
  - At least one year of data with results <50% of human health screening level(s) considering averaging time; or
  - At least two years of data with results below the human health screening level(s) considering averaging time;
- The organic compound may be excluded if fate or transport information demonstrates that the organic compound would be transformed to a less hazardous material prior to reaching the monitoring locations, and/or cannot be reliably measured;
- The organic compound may be included based on consideration of shorter term hazards (e.g., site specific, non-corrective action, projects). Note: AAMP-Analytes for corrective action projects will be addressed in the individual work plan for that project.

Using this process, the organic compound list will also be assessed for compounds that either no longer meet the above criteria, or have consistently demonstrated non-detectable concentrations in routine AAMP monitoring at all AAMP monitoring sites.

Table L-1 summarizes the basis for each analyte. The 'Basis' column in the table below documents the reason the material is being included. SARA 313 means the ratio of the material's highest total calculated annual air emissions (lbs) divided by the ITSL/SRSL value (ug/m^3) is greater than or equal to 100. Section 1910 citation in the 'Basis' column refers to specific 29 CFR Part 1910, Subpart Z chemical standards. Section 1910 chemicals means the ratio of the material's highest total calculated annual air emissions (lbs) divided by the lowest OEL (ug/m^3) is greater than or equal to 1. DEQ Defined Criteria means that the material does not meet either of the criteria defined above, but remains on the list per the request of the DEQ. Additional AAMP-Analytes may be added based on modifications to waste handling processes and/or changes in hazardous waste constituents.

Table L-1. Basis for AAMP Analytes

AAMP–Analyte	CAS	Basis
1,1,2,2 - Tetrachloroethane	79-34-5	SARA 313
Acrylonitrile	107-13-1	SARA 313
Benzene	71-43-2	SARA 313
Chloroform	67-66-3	SARA 313
1,4 -Dichlorobenzene	106-46-7	DEQ Define Criteria
1,2-Dichloroethane	107-06-2	SARA 313
Styrene	100-42-5	DEQ Defined Criteria
1,1,1,2-Tetrachloroethane	630-20-6	DEQ Defined Criteria
1,1,2-Trichloroethane	79-00-5	SARA 313
Trichloroethylene	79-01-6	DEQ Defined Criteria
Total Suspended Particulates (TSP)	NA	NAAQS for TSP/PM-10

Table L-2 Supporting Data for the AAMP Analyte Organic Compounds List

Chemical Name	CAS #	2015 (lbs)	2016 (lbs)	2017 (lbs)	Scr Lvl (ug/m3)	ITSL/SRSL	ITSL/SRSL Ratio	OEL (ug/m3)	OEL Ratio
1,1,1,2-Tetrachloroethane ‡	000630-20-6	88.6	57.75	167.65	1	SRSL	168	687	0.2
1,1,2,2-Tetrachloroethane	000079-34-5	0	32.85	7.3	0.2	SRSL	164	687	0.0
1,1,2-Trichloroethane	000079-00-5	98.55	73	135.05	0.6	SRSL	225	54600	0.0
1,2-Dichloroethane	000107-06-2	734.8225	496.4	813.95	0.4	SRSL	2035	40500	0.0
1,4-Dichlorobenzene	000106-46-7	2131.6474	2077.05	2520	2.5	SRSL	1008	60100	0.0
Acrylonitrile	000107-13-1	32.85	10.95	36.5	0.1	SRSL	365	2170	0.0
Benz(a)anthracene @	000056-55-3	1.7102	3.3057	2.1227	0.02	ITSL	165		
Benzene	000071-43-2	237.7002	225.8542	232.8884	1	SRSL	238	1595	0.1
Chloroform	000067-66-3	1125.11	1197.2	2193.65	4	SRSL	548	244000	0.0
Chloromethyl methyl ether **	000107-30-2	197.1	105.85	120.45				32.9	6.0
Hydrazine @	000302-01-2	0.0322149	0.023178	0.671965	0.002	SRSL	336	13.1	0.1
Pentachlorophenol @	000087-86-5	32.9148	39.0375	73.2325	0.09	SRSL	814	5445	0.0
Quinoline @	000091-22-5	7	6	23	0.01	SRSL	2300	5.28	4.4
Styrene	000100-42-5	2103.4776	793.05	1427.5	20	SRSL	105	85200	0.0
Trichloroethylene	000079-01-6	102.2	91.0264	223.3657	2	ITSL	112	26850	0.0

‡ Compound did not meet the initial screening criteria, but was previously requested by MDEQ to be included.

@ Excluded due to analysis not being supported by labs for EPA Method TO-15.

** Excluded due to the hydrolysis of Bis(chloromethyl) ether (BCME) and Chloromethyl methyl ether (CMME) in water being rapid.

At 20°C, half-lives in water of 38 seconds for BCME and <1 second for CMME have been reported (U.S. EPA, 1980; Tou et al., 1974; Radding et al., 1977). Although BCME and CMME may be degraded by oxidation, the extremely rapid hydrolysis of BCME and CMME in an aqueous medium precludes any oxidative degradation from taking place in aquatic systems (Callahan et al., 1979). BCME is hydrolyzed to formaldehyde and hydrogen chloride (ASTDR, 1989). CMME is hydrolyzed to hydrogen chloride, methanol, and formaldehyde (Travenius, 1982).

Ambient Air Analytical Quality Assurance

For all compounds, the goal is to obtain valid monitoring methods, which have an analytical accuracy of ±30%, a method precision of ±25%, and an applicable concentration range for the sampling period as stated in Table 1 of the SAP. These concentration ranges were chosen based upon expected ambient air levels, levels found in other urban communities, and levels which are biologically relevant.

Dow's Environmental Quality System Documents are designed to document procedures to be followed to provide data of known and documented quality. These procedures cover aspects of quality control (QC), personnel qualifications and training, sample collection, preservation, storage, analysis, records generation, and records review. These documents are consistent with the applicable procedures and principles outlined in U.S. Department of Commerce's National Technical Information Services publication PB-254 658: "Quality Assurance handbook for Air Pollution Measurements Systems."

Samples will be logged into the laboratory system and their condition noted. The receiving person will note any discrepancies or losses of samples before signing the chain-of-custody. The sample will be stored according to the method or Standard Operating Procedure (SOP). Analysts will acknowledge the receipt of samples by signing the chain-of-custody forms. Samples will be stored in a secured refrigerator at the appropriate temperature according to the method.
The standard analytical methods have very specific requirements for QA/QC and these requirements are detailed in the methods. The exact requirements for demonstrating the reliability of a developed method are normally dictated by the specific program. All analytical methods will have the appropriate blanks, spikes, blind spikes, surrogates, and duplicates. Instrument calibration, linearity, maintenance records and raw data will be maintained, and standards will be traceable to the EPA or a manufacturer by name and lot number. Raw data will comply with the definition of Section 7.11 of the "Good Automated Laboratory Practices" guidance document.

At a minimum, one analytical audit will be performed each quarter for all organic compound parameters. For AAMP-Analyte Organic Compounds, all audit samples will be humidified. Audit as defined here means the analyte concentration of the samples is not known to the analyst when the analysis is performed. The audit samples may be purchased or prepared in the laboratory doing the analysis. Annually, well-characterized standards will be obtained from an independent source and analyzed by the laboratory conducting the analysis for audit purposes. The standards will conform to qualifications supplied by U.S. EPA.

Dow or the contract lab performing the analysis commits to a laboratory audit to be conducted by U.S. EPA and MDEQ. At a minimum, Dow or the contract lab will have available for inspection, a suitable package consisting of at least two months of data. Dow agrees to have their SOPs available during an audit. Contract laboratory SOPs will also be made available provided sufficient advance notice is given to obtain the documents (30 days).

The overall responsibility for this program resides with the Environmental Manager of the Midland Analytical Sciences Laboratory of The Dow Chemical Company. The responsibility for collecting and analyzing samples and generating the quality assurance data will reside with some combination of the Environmental Services Department, the Analytical Sciences Laboratory, and contract laboratories.

The responsibility for evaluating the adequacy of the quality assurance information associated with the program and compiling a quarterly interpretative report resides with the Environmental Analytical Sciences Quality Assurance Team.

The QA coordinator or designee is responsible for providing reports to management, keeping track of documents, evaluating and storing data, audit procedures, documenting corrective action and approving and documenting any deviations from the published sampling and analytical methods. The reports to management will include descriptions of the QA system, QA data reports, and audit reports. The coordinator assures documentation exists of the training provided to the personnel collecting and analyzing samples.

Data Reduction and Storage
The specific equations that will be used to calculate all results are included in the sampling and analytical methods.

Several stages of data confirmation will occur. All field and analytical data will be compared to the acceptance criteria of the reference method. All reports will be peer-reviewed. Data submitted to the agency will be reviewed by the QA/QC Coordinator or designee. Any outliers will be treated on a case-by-case basis with appropriate action taken. Any action concerning outliers will be reported to MDEQ.

Data will be retained in accordance with Part 111 operating license records retention requirements. SOPs will be retained according to Dow records retention policies.

Sampler Accuracy
All sampling equipment will be audited at least once per calendar quarter. The audit will consist of a one-point flow rate check within the normal operating range of the sampler. The equipment and personnel used for auditing will be different than those used for normal equipment operation. The standards used for auditing will be traceable to NIST whenever possible. The percentage difference between the actual and measured values is used to assess accuracy of the sampling equipment. Acceptable results will be within ±10 percent (±7 percent for high volume air samplers). Audit results will be reported in the EPA PARS format to the MDEQ Air Quality Division in accordance with the applicable Environmental Monitoring Reporting license condition(s).

Analytical Accuracy
A minimum of one analytical audit (referenced in section 6.5, paragraph 2) will be conducted each calendar quarter using spiked blank sampling media. Two different concentrations of spiked samples will be analyzed. The concentration level of one of these spiked samples will be at a level of that expected in ambient air. The audit samples will be prepared using different standards than those used for normal equipment calibrations. Audit standards will be traceable to NIST whenever possible. In addition, audit samples will be extracted using the same extraction procedure that is used for sample analysis. Method accuracy will be calculated as described in 40 CFR 58, Appendix A. Acceptable results will be within ±30 percent for EPA Reference Methods. Analytical audit results will be reported in accordance with the applicable Environmental Monitoring Reporting license condition(s).

Method Precision
To assess precision, co-located samplers will be operated at sampling Site 1E/1W for each event. The two samplers will be within 2 and 4 meters of each other. In addition the calibration, sampling, and analytical procedures will be the same for both samplers. One sampler will be used to report the sample measurements and the other will be designated as the duplicate sampler. Method precision will be calculated as described in 40 CFR 58, Appendix A. Acceptable results will be within ±25 percent for EPA Reference Methods. Precision results will be submitted in the annual quality assurance summary (described in Table 2-W of the SAP).

Appendix M

Background Data and Statistical Methodology

Statistical Methodology

The statistical methods to analyze background (baseline) data are described in the U.S. EPA guidance document, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance* (USEPA 2009) and are followed in this Appendix. The overall approach was to derive a background threshold value (BTV) for each analyte based on the statistical evaluation of a given background data set. Future monitoring concentrations would then be compared against the respective BTV. Any monitoring concentrations that exceed the BTV may be considered to be an initial indication of potential contamination or release from the landfill operation. The intra-well approach was used to compare monitoring concentrations at each sampling location against the BTV derived from the historic baseline data at that given location.

This statistical evaluation appendix is specifically written for the Dow Chemical Company (Dow) Midland Plant and Salzburg Landfill Facilities monitoring program, which includes the following elements or divisions:

- Groundwater (GW) monitoring wells for the Salzburg Landfill site
- Leak Detection System (LDS) lift stations for the Salzburg Landfill site
- Groundwater (GW) monitoring wells for the Ash Pond site
- Groundwater (GW) monitoring well for the Tertiary Pond site
- Groundwater (GW) monitoring wells for the Poseyville Landfill site
- Surface Water (SW) monitoring locations for the Salzburg Landfill site

The details of the background data used are described in Step 1 below.

The main steps in deriving BTVs were:

1. Establish baseline data sets.
2. Check for potential outliers.
3. Calculate summary statistics.
4. Perform trend analysis.
5. Derive BTVs.

1. Establish Background Data Sets

The Michigan Department of Environmental Quality Part 111 Natural Resources and Environmental Protection Act, R 299.9612, requires collection of a series of groundwater samples to determine background or baseline concentrations for the Dow Chemical Company (Dow) Midland Plant and Salzburg Landfill Facilities monitoring program. A minimum of eight samples were typically required to determine the background or historic baseline concentrations of constituents in the different environmental monitoring systems/media, and initial background data sets were established for 20 groundwater (GW #1) monitoring wells after the October 2012 sampling event for the Salzburg Landfill site.

In 2016, additional quarterly data were collected for the Leak Detection System (LDS) for the Salzburg Landfill site, and therefore, the background data sets and the statistical evaluation were desired to be expanded to include these new data points for this medium, as no strong evidence indicating that a significant change had occurred in the site during the baseline period. The LDS background data sets and corresponding statistics were updated in August 2016.

In 2018, eight additional groundwater (GW #2) monitoring wells for the Ash Pond site, the Tertiary Pond site, and the Poseyville Landfill site; and three surface water (SW) monitoring locations for the Salzburg Landfill site were identified to be included in the statistical evaluation for the merged Sampling and Analysis Plan (SAP) of the Dow Midland Plant and Salzburg Landfill Facilities monitoring program, following the May and August 2018 sampling events. Also, additional data were collected for one recently installed LDS location (LS 28 [Cells 23-26]) since 2016, and because the baseline sample size was relatively small during the 2016 statistical calculation, the background statistics for this particular location was also updated in 2018 to include more recent data.

Results from analyses of these samples were evaluated as discussed below. Additional sampling may be performed for including in the background data set if needed in the future.

Sampling data were collected in three different media/system; the Leak Detection System (LDS), groundwater (GW) monitoring wells, and surface water (SW) locations. A separate baseline data set was established for each medium and each location (i.e., an intra-well or intra-location approach). The baseline periods used for the three media were as follows:

- Salzburg Landfill Leak Detection System (LDS), 9 locations – from 2009 to April 2016 (except for the new LS 28 [Cells 23-26], where samples were collected starting from June 2015 through January 2018; statistical calculations currently performed for this appendix). During the 2016 statistical update, older historic data of total organic carbon prior to 2009 were excluded.
- Salzburg Landfill Groundwater (GW #1), 20 locations – generally from the beginning of data collection to 2012 (due to limited historic sample sizes for many wells/analytes, the baseline period for all GW extended through 2012 during the 2016 statistical update).
- Ash Pond Groundwater (GW #2), 8 locations – from 2003/2004/2006 to 2018; statistical calculations currently performed for this appendix.
    - Ash Pond, 5 locations
    - Tertiary Pond, 1 location
    - Poseyville Landfill, 2 locations
- Salzburg Landfill Surface Water (SW), 3 locations – from 2000/2009 to 2018; statistical calculations currently performed for this appendix.

For LDS, GW #1, and SW, total organic carbon and concentrations of five inorganic constituents (cobalt, copper, cyanide, selenium, and vanadium) were evaluated statistically using the methods described below. For GW #2, one or more of the following constituents were selected for statistical evaluation: arsenic, boron, benzene, chlorobenzene, chloroform, and ethylbenzene.

A series of LDS, GW, and SW samples were collected to determine background/baseline concentrations for the Dow Midland Plant and Salzburg Landfill Facilities monitoring program. A minimum of eight samples were generally required to determine the background/baseline concentrations of organic/inorganic constituents and total organic carbon. One data set (selenium of MW-4667) had only seven samples and were considered marginally adequate. Results from analyses of these samples were evaluated statistically as discussed below. Additional quarterly or semi-annual sampling will be performed in the future, and if these future samples are consistent with the baseline condition, they will be included in the future baseline data set updates. The baseline data set and the associated baseline statistics will be updated overtime as appropriate, with limitations as discussed in Section 2.4 (i.e., the baseline updating will be performed after at least eight new additional samples) (USEPA 2009).

2. Check for Potential Outliers

Prior to calculating summary statistics, each baseline data set was screened for potential outliers. Anomalous (high or low) values in the baseline data sets were reviewed and excluded when appropriate. Baseline data were tested for outliers using Dixon's Test or Rosner's Test at 1 percent significance level (99% confidence level) on the sample values, followed by manual inspection/outlier determination of the data set (USEPA 2006).

Dixon's Test was used when the number of data points in the sample data set was less than 25, and the Rosner's Test was used when there were 25 or more data points. In the majority of cases, this was sufficiently effective in excluding non-representative sample values and allowed for a conservative estimation of background statistics.

For GW #1, the original resulting BTVs (using the upper prediction limit (UPL) method, as described further below) for copper averaged 17.5 ug/L, with a median of 10 ug/L. This suggested a few higher results from certain wells may be skewing the average. On inspection, the computed UPLs for copper for wells MW-4838, MW-4840, and MW-5594 ranged from 40 to 80 ug/L, which were significantly higher than the UPLs for the remaining site GW wells. Wells MW-4838, MW-4840, and MW-5594 had a low detection frequency (<25 percent detected results) for copper, and the resulting UPLs were driven by one or two high detections which were never replicated, and in some cases, coincided (suggesting potential lab contamination or similar sampling/analytical issues related to specific events). Based on these findings, the entire data sets were reviewed, and the higher values were eliminated from the data sets as they were deemed to be non-representative of the data set as a whole. In these special cases, there were at least 25 sample results; however, only a few represented detected values.

The same procedure was followed for cobalt in well MW-5594, which had an initial computed UPL of 31 ug/L, and the average for all GW cobalt concentrations at the site was around 3 ug/L. The cobalt background data set for well MW-5594 also had a low detection frequency (<25 percent detected results), and after reviewing the entire data set as a whole, a small number of high values, which were never replicated again, were eliminated, resulting in a UPL that was more closely matched with the remaining GW wells at the site.

Table M-1 identifies the number of confirmed outliers in each baseline data set. It should be noted that excluding high-value outliers would lower the baseline limit against which future sample values would be compared. This would reduce the probability of failing to detect the future monitoring concentrations that exceed the baseline condition.

3. Calculate Summary Statistics

After removing outliers from the baseline data as described above, summary statistics for each data set (i.e., the results for each analyte from each location) were calculated and are shown in Table M-1. The summary statistics include the sample size, detection rate, mean, standard deviation, minimum and maximum detected values, minimum and maximum reporting limits of non-detects, first and last sample dates, and upper prediction limits (UPLs). The methodology to derive UPL is described in Step 5 below.

For calculating summary statistics, numerical results were needed for every analytical measurement, even if the analytical measurement was non-detectable. When a result was defined as “not detected,” half of the reporting limit was used as an estimated value.

4. Perform Trend Analysis

The baseline data used to derive BTVs should not exhibit any time trends (i.e., a stable condition). A non-parametric test for trends called the Mann-Kendall test was used to detect an upward or downward trend for the data set. The Mann-Kendall trend test is based on the ranks of the data, and therefore, does not require a distributional assumption (e.g. normality). The use of the ranked observations rather than the observations themselves help to minimize the potential impact of outliers on the results and allows the test to detect trends that are monotonically increasing or decreasing, though not necessarily in linear fashion. Computational details for this test are provided in Gilbert (1987). The test was performed at the 0.05 significance level (i.e., *p*-values smaller than 0.05 were required before the test was concluded to be significant). This means that strong evidence (95% confidence level) was required before a trend was labeled as "significant." The Mann-Kendall trend test was performed for data sets with a detection frequency of at least 25 percent. The results of the Mann-Kendall trend test, including the Mann-Kendall *S* statistics, the associated *p*-values, and the trend conclusions, are summarized in Table M-1.

If a significant upward or downward trend was concluded by the Mann-Kendall test (using the entire data history), but the recent portion (i.e., latter periods) of the data set did not exhibit significant trend (based on visual inspection of time-series plots), this recent portion of the data set was evaluated again using the Mann-Kendall test to determine if there was any significant trend. If it was confirmed no significant trend existed, this recent portion of the data set was used to derive the BTV, and this condition could be observed with the TOC data from earlier groundwater monitoring events.

The data from the baseline period were ideally required to be stationary over time in order for intrawell UPL testing. For some well-analytes with very long history (and particularly for TOC of groundwater), the concentrations appeared to be higher in the earlier periods (i.e., 80s and 90s), and thus, creating a downward trend. Conversely, for TOC of the LDS, the concentrations appeared to be lower in the earlier periods, and thus, creating an upward trend. The concentrations for groundwater in many cases were more stable in recent periods (i.e., 2000s), and hence, only data from the recent periods were used for these cases. It should be noted that excluding high values (from the earlier periods) would result in a lower UPL, which is a more environmentally conservative approach. For the LDS, given the baseline history was comparatively short, a recent stable period was not able to be identified.

For a number of data sets, significant upward or downward trends were evident and a stable recent period could not be identified. The UPLs were still developed (using the available data) but were considered to be provisional. According to the U.S. EPA guidance (2009), the background variance may be overestimated and biased on the high side, leading to higher than expected and ultimately less powerful prediction limits. Thus, for these data sets with pre-existing baseline trends, supplemental assessments based on visual inspection of graphical displays and other lines of evidence would also be conducted.

5. Derive Background Threshold Values (BTVs)

In the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance* published in March 2009 (USEPA 2009), one of the recommended statistics to derive BTVs is the upper prediction limit (UPL). The UPL is an estimate of an upper boundary on the concentrations of future samples, with a prescribed confidence level if drawn from the baseline population. In the 2009 USEPA guidance, the annual site-wide false positive rate (SWFPR) is recommended to be 10% (i.e., 90% confidence level). Based on this guidance, the 90% confidence level for all quarterly samples collected each year was assumed for this evaluation. The resulting UPL can be represented as the 90% UPL on a SWFPR basis.

To control both the false positive and false negative probability error rates, the USEPA Unified Guidance (2009) recommends using a retesting strategy for groundwater detection monitoring program. This strategy involves comparing a monitoring concentration at a sampling location to the UPL. If the monitoring concentration exceeds the UPL, one or more re-samples are taken and again compared to the UPL. If the re-sample(s) also exceed the UPL, the sampling location is considered to have a concentration significantly higher than the background/baseline. Otherwise, it is not considered to be an exceedance of the baseline condition.

For this evaluation, the “1-of-2” retesting strategy suggested in the USEPA Unified Guidance (2009) was assumed. This strategy means that if the original monitoring sample is below the applicable background UPL, the monitoring location is considered to be no different than the background/baseline. If the original sample exceeds the UPL, one resample is taken and compared against the same UPL. If the resample is below the UPL, the monitoring location is considered to be no different than the background/baseline and the initial exceedance is not confirmed. If the resample also exceeds the UPL, the monitoring location is considered to be significantly higher than the background/baseline and the exceedance is confirmed. When collecting confirmation samples, in order to be in agreement with Table 2 of the SAP, one sample will be collected. If the confirmation sample is above the UPL, the detections are considered statistically different from the background/baseline (i.e., a confirmed statistically significant increase).

To calculate the UPL, the statistical distribution (e.g., “normal” distribution) for each data set (i.e., the baseline results for each analyte from each location) had to be evaluated. The following methodology was used to determine each statistical distribution:

- If fewer than seven or eight results were available, no distribution was defined (i.e., baseline development was still in progress and no further statistical evaluation would be performed at this time);

- If at least seven or eight results were available and there were no non-detects (i.e., 100% detected), then the data set was tested for normality using raw data with the Shapiro-Wilk W test (USEPA 2006), with a significance level of 0.05. If the Shapiro-Wilk W test showed no evidence against normality, then the distribution was assumed to be normal and a parametric UPL based on normal distribution was calculated. Otherwise, the normal distribution assumption was rejected, and a non-parametric UPL was calculated; and

- If at least seven or eight results were available and there were non-detect(s) (i.e., not 100% detected), a non-parametric UPL was calculated.

The following equation from the USEPA Unified Guidance was used for the calculation of a parametric UPL at a given sampling location for a given analyte:

$$\text{UPL} = \text{sample mean} + K \times \text{sample standard deviation}$$

in which K = a factor selected from Table 19-10 in the USEPA Unified Guidance.

For the intra-well comparison method, the selection of the factor *K* requires assumptions about the number of constituents to be monitored, the number of sampling locations, the background sample size, the retesting strategy, and the sampling frequency.

If a data set could not be assumed to be normally distributed, or if it contained one or more non-detects, a non-parametric UPL was calculated. Following the USEPA Unified Guidance (Table 19-19), the non-parametric UPL was set to either the highest or the second highest detected concentration. The achieved site-wide false positive rate for the non-parametric UPL depends on the background sample size and the other parameters specified in M-1. If the target false positive rate and power are achieved with the second highest detected concentration, that concentration is taken as the non-parametric UPL. If the target false positive rate and power are not achieved with the second highest detected concentration, the highest detected concentration is selected as the UPL.

For analytes with all baseline data consisted of non-detects, the “Double Quantification Rule” described in Chapter 6 of the 2009 USEPA Unified Guidance was used, as follows:
“A confirmed exceedance is registered if any well-constituent pair in the ‘100% non-detect’ group exhibits quantified measurements (i.e., at or above the reporting limit [RL]) in two consecutive sample and resample events.” In other words, for these previously non-detect parameters, an exceedance is confirmed if and only if both initial and confirmatory sample results were detected above the respective RLs. This approach is analogous of using the RL as the UPL.

The results of the Shapiro-Wilk W test, the method used to calculate the UPL (parametric or non-parametric), and the calculated UPLs are shown in and Table M-1, for each of the sampling locations/analytes. For parametric (i.e., normal-based) UPL, the minimum background sample sizes required to achieve sufficient statistical power were 16 and 10, for GW #1 and LDS, respectively, and some location-analytes had not reached this minimum sample size; therefore, future updating of these background statistics is important. For GW #2 and SW, the minimum background sample size for parametric UPL has been attained.

For non-parametric UPL, the highest detected concentration was selected. However, it should be noted that the target per-constituent significance level, as listed in Table 19-19 of the 2009 USEPA Unified Guidance, was not achieved for some location-analytes, as the minimum sample sizes for non-parametric UPL (using the highest detected value) had not been reached. Hence, the annual site-wide false positive error is likely higher than the recommended 10%, which is a more conservative approach (i.e., more protective of the environment and public health) and the power of detecting a statistically significant increase would be greater than expected. Again, as additional samples will be collected, future updating of these background statistics will be beneficial with a larger sample size.

References

Gilbert, Richard O. *Statistical Methods for Environmental Pollution Monitoring*. New York: Van Nostrand Reinhold Company. 1987.

Shapiro, S. S. and M. B. Wilk, 1965. "An Analysis of Variance Test for Normality (complete samples)," *Biometrika*, 52, 591-611.

USEPA. 2006. *Data Quality Assessment: Statistical Methods for Practitioners (EPA QA/G-9S).* Office of Environmental Information, U.S. Environmental Protection Agency, Report No. EPA/240/B-06/003.

USEPA. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance.* Office of Resource Conservation and Recovery, U.S. Environmental Protection Agency, Report No. EPA 530-R-09-007.

Table M-1. Background Statistical Evaluation Results Summary

							Summary Statistics						Sample Date Range		Baseline Data Trend Analysis			Shapiro-Wilk W Test		Upper Prediction Limit (UPL)		
Media	Location	Constituent	Unit	No. of Outliers / Earlier Samples Excluded	No. of Samples Used	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	First Sample Date	Last Sample Date	Mann-Kendall S Statistic	p-value	Trend Test Result	Normality Test p-value	Distribution	*K*-Multiplier	UPL with Retesting Strategy	Note
GTRA-SLF	MW-2708	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-2708	Copper	ug/L	0	54	26%	1.51	1.76	0.65	6	0.5	3	3/6/1987	10/31/2012	**-131**	**0.091**	**No Trend**	-	Non-parametric	-	**6**	
GTRA-SLF	MW-2708	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-2708	Selenium	ug/L	0	8	0%	-	-	-	-	1	1	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-2708	Total Organic Carbon	ug/L	33	21	62%	902	433	376.8725	1610	1000	1000	4/23/2002	10/31/2012	**51**	**0.051**	**No Trend**	-	Non-parametric	-	**1610**	
GTRA-SLF	MW-2708	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-3011	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/28/2009	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-3011	Copper	ug/L	0	53	19%	1.19	1.18	1	4	0.5	3	3/6/1987	10/30/2012	-	-	-	-	Non-parametric	-	**4**	
GTRA-SLF	MW-3011	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-3011	Selenium	ug/L	0	8	0%	-	-	-	-	1	1	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-3011	Total Organic Carbon	ug/L	40	13	100%	1768	161	1440	1980	-	-	10/3/2006	10/30/2012	**-24**	**0.080**	**No Trend**	0.605	Normal	2.72	**2204**	
GTRA-SLF	MW-3011	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-3013	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/28/2009	10/29/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-3013	Copper	ug/L	0	26	19%	0.784	0.901	1.1	3.9	0.5	2.29	4/18/2000	10/29/2012	-	-	-	-	Non-parametric	-	**3.9**	
GTRA-SLF	MW-3013	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/29/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-3013	Selenium	ug/L	0	8	0%	-	-	-	-	1	1	4/28/2009	10/29/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-3013	Total Organic Carbon	ug/L	0	26	69%	1682	1369	1210	6800	1000	1000	4/18/2000	10/29/2012	**-20**	**0.335**	**No Trend**	-	Non-parametric	-	**6800**	
GTRA-SLF	MW-3013	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/29/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4666	Cobalt	ug/L	0	8	100%	10.2	3.5	5.61	15.7	-	-	4/28/2009	10/31/2012	**4**	**0.355**	**No Trend**	0.280	Normal	3.4	**22.0**	
GTRA-SLF	MW-4666	Copper	ug/L	13	34	26%	0.834	1.134	0.65	5.6	0.5	1	4/30/1996	10/31/2012	**27**	**0.280**	**No Trend**	-	Non-parametric	-	**5.6**	
GTRA-SLF	MW-4666	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4666	Selenium	ug/L	0	8	0%	-	-	-	-	1	1	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4666	Total Organic Carbon	ug/L	34	13	100%	8795	342	8300	9550	-	-	10/3/2006	10/31/2012	**-31**	**0.033**	**Downward**	0.643	Normal	2.72	**9727**	Marginal downward trend in baseline
GTRA-SLF	MW-4666	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4667	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4667	Copper	ug/L	13	34	29%	0.759	0.747	0.5	4.2	0.5	1	4/30/1996	10/31/2012	**-73**	**0.053**	**No Trend**	-	Non-parametric	-	**4.2**	
GTRA-SLF	MW-4667	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4667	Selenium	ug/L	0	7	0%	-	-	-	-	1	1	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4667	Total Organic Carbon	ug/L	34	13	100%	7332	288	6850	7900	-	-	10/3/2006	10/31/2012	**-20**	**0.122**	**No Trend**	0.692	Normal	2.72	**8115**	
GTRA-SLF	MW-4667	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4829	Cobalt	ug/L	0	8	13%	2.75	1.92	7	7	0.032	5	4/28/2009	12/12/2012	-	-	-	-	Non-parametric	-	**7**	
GTRA-SLF	MW-4829	Copper	ug/L	1	66	29%	2.15	2.60	0.52	10	0.5	3	2/23/1982	12/12/2012	**-88**	**0.260**	**No Trend**	-	Non-parametric	-	**10**	
GTRA-SLF	MW-4829	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	12/12/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4829	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	12/12/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4829	Total Organic Carbon	ug/L	57	24	83%	3691	1957	1700	8400	1000	1000	4/24/2001	12/12/2012	**35**	**0.199**	**No Trend**	-	Non-parametric	-	**8400**	
GTRA-SLF	MW-4829	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	12/12/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4830	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4830	Copper	ug/L	1	67	27%	2.49	3.25	0.65	12.2	0.5	3	2/23/1982	10/31/2012	**9**	**0.477**	**No Trend**	-	Non-parametric	-	**12.2**	
GTRA-SLF	MW-4830	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4830	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4830	Total Organic Carbon	ug/L	57	24	67%	1363	641	1540	2200	1000	1000	4/24/2001	10/31/2012	**30**	**0.231**	**No Trend**	-	Non-parametric	-	**2200**	
GTRA-SLF	MW-4830	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4831	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4831	Copper	ug/L	0	63	35%	5.52	10.20	0.74	44	0.5	3	2/23/1982	10/31/2012	**-107**	**0.223**	**No Trend**	-	Non-parametric	-	**44**	
GTRA-SLF	MW-4831	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4831	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4831	Total Organic Carbon	ug/L	43	31	87%	4001	2342	2000	8300	1000	1000	5/6/1997	10/31/2012	**-135**	**0.011**	**Downward**	-	Non-parametric	-	**8300**	Marginal downward trend in baseline
GTRA-SLF	MW-4831	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4832	Cobalt	ug/L	0	14	0%	-	-	-	-	0.032	5	4/11/2006	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4832	Copper	ug/L	1	68	29%	2.47	3.19	0.78	13	0.5	3	2/23/1982	10/31/2012	**-39**	**0.398**	**No Trend**	-	Non-parametric	-	**13**	
GTRA-SLF	MW-4832	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4832	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4832	Total Organic Carbon	ug/L	62	25	80%	2491	1128	1900	4300	1000	1000	10/10/2000	10/31/2012	**-18**	**0.345**	**No Trend**	-	Non-parametric	-	**4300**	
GTRA-SLF	MW-4832	Vanadium	ug/L	0	14	0%	-	-	-	-	0.142	5	4/11/2006	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4833	Cobalt	ug/L	0	14	0%	-	-	-	-	0.032	5	4/11/2006	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4833	Copper	ug/L	1	68	40%	3.11	3.90	0.55	13.8	0.5	3	2/23/1982	10/31/2012	**-126**	**0.191**	**No Trend**	-	Non-parametric	-	**13.8**	
GTRA-SLF	MW-4833	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4833	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4833	Total Organic Carbon	ug/L	72	13	100%	1751	168	1530	2140	-	-	10/3/2006	10/31/2012	**-30**	**0.038**	**Downward**	0.371	Normal	2.72	**2208**	Marginal downward trend in baseline
GTRA-SLF	MW-4833	Vanadium	ug/L	0	14	0%	-	-	-	-	0.142	5	4/11/2006	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects

Table M-1. Background Statistical Evaluation Results Summary

							Summary Statistics						Sample Date Range		Baseline Data Trend Analysis			Shapiro-Wilk W Test		Upper Prediction Limit (UPL)		
Media	Location	Constituent	Unit	No. of Outliers / Earlier Samples Excluded	No. of Samples Used	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	First Sample Date	Last Sample Date	Mann-Kendall S Statistic	p-value	Trend Test Result	Normality Test p-value	Distribution	*K*-Multiplier	UPL with Retesting Strategy	Note
GTRA-SLF	MW-4834	Cobalt	ug/L	0	14	0%	-	-	-	-	0.032	5	4/11/2006	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4834	Copper	ug/L	0	70	36%	2.23	2.42	0.6	10	0.5	3	2/23/1982	10/30/2012	**-102**	**0.231**	**No Trend**	-	Non-parametric	-	**10**	
GTRA-SLF	MW-4834	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4834	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4834	Total Organic Carbon	ug/L	64	22	23%	650	321	1020	1340	500	1000	4/23/2002	10/30/2012	-	-	-	-	Non-parametric	-	**1340**	
GTRA-SLF	MW-4834	Vanadium	ug/L	0	14	0%	-	-	-	-	0.142	5	4/11/2006	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4836	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/27/2009	10/29/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4836	Copper	ug/L	1	67	27%	1.77	1.68	0.5	7.3	0.5	3	2/23/1982	10/29/2012	**9**	**0.475**	**No Trend**	-	Non-parametric	-	**7.3**	
GTRA-SLF	MW-4836	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/29/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4836	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/29/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4836	Total Organic Carbon	ug/L	62	21	5%	520	157	1160	1160	500	1000	11/20/2002	10/29/2012	-	-	-	-	Non-parametric	-	**1160**	
GTRA-SLF	MW-4836	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/27/2009	10/29/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4837	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4837	Copper	ug/L	1	68	24%	1.78	2.00	0.51	9	0.5	3	2/23/1982	10/31/2012	-	-	-	-	Non-parametric	-	**9**	
GTRA-SLF	MW-4837	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4837	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4837	Total Organic Carbon	ug/L	59	22	18%	591	236	1010	1130	500	1000	4/23/2002	10/31/2012	-	-	-	-	Non-parametric	-	**1130**	
GTRA-SLF	MW-4837	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4838	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4838	Copper	ug/L	2	66	15%	1.42	1.49	0.58	7	0.5	3	2/23/1982	10/31/2012	-	-	-	-	Non-parametric	-	**7**	
GTRA-SLF	MW-4838	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4838	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4838	Total Organic Carbon	ug/L	55	14	100%	2220	191	1990	2600	-	-	4/11/2006	10/31/2012	**-36**	**0.027**	**Downward**	0.312	Normal	2.66	**2727**	Marginal downward trend in baseline
GTRA-SLF	MW-4838	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4839	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4839	Copper	ug/L	1	67	9%	1.19	1.29	0.74	10	0.5	3	2/23/1982	10/31/2012	-	-	-	-	Non-parametric	-	**10**	
GTRA-SLF	MW-4839	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4839	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4839	Total Organic Carbon	ug/L	54	13	100%	3178	162	2970	3480	-	-	10/3/2006	10/31/2012	**-25**	**0.071**	**No Trend**	0.388	Normal	2.72	**3618**	
GTRA-SLF	MW-4839	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4840	Cobalt	ug/L	0	8	13%	3.13	2.91	10	10	0.032	5	4/28/2009	10/31/2012	-	-	-	-	Non-parametric	-	**10**	
GTRA-SLF	MW-4840	Copper	ug/L	2	65	6%	1.09	0.90	1.2	6.8	0.5	3	2/23/1982	10/31/2012	-	-	-	-	Non-parametric	-	**6.8**	
GTRA-SLF	MW-4840	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4840	Selenium	ug/L	0	23	0%	-	-	-	-	1	10	2/23/1982	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-4840	Total Organic Carbon	ug/L	55	13	100%	1976	163	1760	2260	-	-	4/11/2006	10/31/2012	**-5**	**0.403**	**No Trend**	0.023	Non-parametric	-	**2260**	
GTRA-SLF	MW-4840	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5213	Cobalt	ug/L	0	24	17%	3.89	3.57	9.88	14	0.032	5	4/18/2000	10/31/2012	-	-	-	-	Non-parametric	-	**14**	
GTRA-SLF	MW-5213	Copper	ug/L	0	43	56%	2.07	2.42	0.5	10	0.5	3	9/24/1992	10/31/2012	**-97**	**0.137**	**No Trend**	-	Non-parametric	-	**10**	
GTRA-SLF	MW-5213	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5213	Selenium	ug/L	0	8	0%	-	-	-	-	1	1	4/27/2009	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5213	Total Organic Carbon	ug/L	33	13	100%	3963	256	3580	4440	-	-	10/3/2006	10/31/2012	**-44**	**0.004**	**Downward**	0.292	Normal	2.72	**4658**	Downward trend in baseline
GTRA-SLF	MW-5213	Vanadium	ug/L	0	24	4%	1.98	0.82	3	3	0.142	5	4/18/2000	10/31/2012	-	-	-	-	Non-parametric	-	**3**	
GTRA-SLF	MW-5594	Cobalt	ug/L	1	22	14%	3.68	3.47	11	14	0.032	5	4/18/2000	10/30/2012	-	-	-	-	Non-parametric	-	**14**	
GTRA-SLF	MW-5594	Copper	ug/L	2	25	12%	0.52	0.40	0.64	2.19	0.5	1	11/13/1996	10/30/2012	-	-	-	-	Non-parametric	-	**2.19**	
GTRA-SLF	MW-5594	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/27/2009	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5594	Selenium	ug/L	0	8	0%	-	-	-	-	1	1	4/27/2009	10/30/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5594	Total Organic Carbon	ug/L	8	19	16%	582	239	1010	1190	500	1000	4/23/2002	10/30/2012	-	-	-	-	Non-parametric	-	**1190**	
GTRA-SLF	MW-5594	Vanadium	ug/L	0	23	4%	2.09	1.17	6	6	0.142	5	4/18/2000	10/30/2012	-	-	-	-	Non-parametric	-	**6**	
GTRA-SLF	MW-5780	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5780	Copper	ug/L	0	31	26%	0.650	0.561	0.64	2.6	0.5	1	12/10/1997	10/31/2012	**-7**	**0.430**	**No Trend**	-	Non-parametric	-	**2.6**	
GTRA-SLF	MW-5780	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5780	Selenium	ug/L	0	8	0%	-	-	-	-	1	1	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5780	Total Organic Carbon	ug/L	18	13	100%	7482	298	7210	8280	-	-	10/3/2006	10/31/2012	**-21**	**0.111**	**No Trend**	0.006	Non-parametric	-	**8280**	
GTRA-SLF	MW-5780	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5949	Cobalt	ug/L	0	8	0%	-	-	-	-	0.032	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5949	Copper	ug/L	1	26	15%	0.521	0.284	0.5	1.4	0.5	1	10/12/1999	10/31/2012	-	-	-	-	Non-parametric	-	**1.4**	
GTRA-SLF	MW-5949	Cyanide	ug/L	0	8	0%	-	-	-	-	3.6	5	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5949	Selenium	ug/L	0	8	0%	-	-	-	-	1	1	4/28/2009	10/31/2012	-	-	-	-	-	-	**RL**	All baseline data are nondetects
GTRA-SLF	MW-5949	Total Organic Carbon	ug/L	0	27	70%	2191	1629	2100	8300	1000	1000	10/12/1999	10/31/2012	**-33**	**0.249**	**No Trend**	-	Non-parametric	-	**8300**	

Table M-1. Background Statistical Evaluation Results Summary

							Summary Statistics						Sample Date Range		Baseline Data Trend Analysis			Shapiro-Wilk W Test		Upper Prediction Limit (UPL)		
Media	Location	Constituent	Unit	No. of Outliers / Earlier Samples Excluded	No. of Samples Used	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	First Sample Date	Last Sample Date	Mann-Kendall S Statistic	p-value	Trend Test Result	Normality Test p-value	Distribution	*K*-Multiplier	UPL with Retesting Strategy	Note
GTRA-SLF	MW-5949	Vanadium	ug/L	0	8	0%	-	-	-	-	0.142	2	4/28/2009	10/31/2012	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	Cleanout (Cells 20-22)	Cobalt	ug/L	4	20	0%	-	-	-	-	5	5	10/20/2009	4/12/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	Cleanout (Cells 20-22)	Copper	ug/L	0	24	83%	2.99	1.67	1	6.61	1	4	10/20/2009	4/12/2016	-41	0.148	No Trend	-	-	-	6.61	
LDS	Cleanout (Cells 20-22)	Cyanide	ug/L	0	23	0%	-	-	-	-	5	5	10/20/2009	4/12/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	Cleanout (Cells 20-22)	Selenium	ug/L	0	23	100%	7.06	4.53	1.8	19	-	-	10/20/2009	4/12/2016	57	0.069	No Trend	0.009	Non-parametric	-	19	
LDS	Cleanout (Cells 20-22)	Total Organic Carbon	ug/L	0	23	100%	3807	3153	1160	15000	-	-	10/20/2009	4/12/2016	119	0.001	Upward	<.0001	Non-parametric	-	15000	Upward trend in baseline
LDS	Cleanout (Cells 20-22)	Vanadium	ug/L	1	24	0%	-	-	-	-	2	4	10/20/2009	4/12/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS11 (Cells 11-12)	Cobalt	ug/L	5	29	0%	-	-	-	-	5	5	6/17/2009	4/12/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS11 (Cells 11-12)	Copper	ug/L	2	32	69%	1.22	0.59	1.03	2.34	1	1	4/21/2009	4/12/2016	26	0.340	No Trend	-	-	-	2.34	
LDS	LS11 (Cells 11-12)	Cyanide	ug/L	0	33	0%	-	-	-	-	5	5	4/21/2009	4/12/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS11 (Cells 11-12)	Selenium	ug/L	2	30	0%	-	-	-	-	1	1	4/21/2009	4/12/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS11 (Cells 11-12)	Total Organic Carbon	ug/L	1	33	100%	7162	4674	2910	21000	-	-	4/21/2009	4/12/2016	111	0.044	Upward	<.0001	Non-parametric	-	21000	Marginal upward trend in baseline
LDS	LS11 (Cells 11-12)	Vanadium	ug/L	3	32	3%	1.02	0.12	1.7	1.7	2	2	4/21/2009	4/12/2016	-	-	-	-	-	-	RL	Only 1 detected result below all RLs
LDS	LS12 (Cells 13-14)	Cobalt	ug/L	6	28	0%	-	-	-	-	5	5	6/17/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS12 (Cells 13-14)	Copper	ug/L	0	40	80%	2.62	1.97	0.675	7.8	1	4	4/21/2009	4/11/2016	-51	0.278	No Trend	-	-	-	7.8	
LDS	LS12 (Cells 13-14)	Cyanide	ug/L	0	33	0%	-	-	-	-	5	5	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS12 (Cells 13-14)	Selenium	ug/L	2	28	0%	-	-	-	-	1	1	5/19/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS12 (Cells 13-14)	Total Organic Carbon	ug/L	1	32	100%	3228	1239	1970	7500	-	-	4/21/2009	1/11/2016	168	0.003	Upward	<.0001	Non-parametric	-	7500	Upward trend in baseline
LDS	LS12 (Cells 13-14)	Vanadium	ug/L	3	32	0%	-	-	-	-	2	2	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS20 (Cells 15-16)	Cobalt	ug/L	5	29	0%	-	-	-	-	5	5	6/17/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS20 (Cells 15-16)	Copper	ug/L	0	35	80%	3.35	2.18	1.1	9.1	1	4	4/21/2009	4/11/2016	-48	0.251	No Trend	-	-	-	9.1	
LDS	LS20 (Cells 15-16)	Cyanide	ug/L	0	33	0%	-	-	-	-	5	5	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS20 (Cells 15-16)	Selenium	ug/L	2	30	0%	-	-	-	-	1	1	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS20 (Cells 15-16)	Total Organic Carbon	ug/L	2	31	100%	4235	701	3100	5610	-	-	4/21/2009	1/11/2016	113	0.028	Upward	0.195	Normal	2.25	5811	Marginal upward trend in baseline
LDS	LS20 (Cells 15-16)	Vanadium	ug/L	3	32	0%	-	-	-	-	2	2	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS21 (Cells 17-19)	Cobalt	ug/L	5	29	0%	-	-	-	-	5	5	6/17/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS21 (Cells 17-19)	Copper	ug/L	0	36	92%	2.38	1.06	1.03	4.68	1	4	4/21/2009	4/11/2016	45	0.274	No Trend	-	-	-	4.68	
LDS	LS21 (Cells 17-19)	Cyanide	ug/L	0	33	0%	-	-	-	-	5	5	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS21 (Cells 17-19)	Selenium	ug/L	2	32	28%	0.847	0.607	1.1	2.4	1	1	4/21/2009	4/11/2016	168	0.000	Upward	-	-	-	2.4	Upward trend in baseline
LDS	LS21 (Cells 17-19)	Total Organic Carbon	ug/L	1	32	100%	2930	1928	1560	10000	-	-	4/21/2009	1/12/2016	258	0.000	Upward	<.0001	Non-parametric	-	10000	Upward trend in baseline
LDS	LS21 (Cells 17-19)	Vanadium	ug/L	3	32	0%	-	-	-	-	2	2	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS3A (Cells 3-5)	Cobalt	ug/L	2	32	0%	-	-	-	-	5	5	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS3A (Cells 3-5)	Copper	ug/L	4	30	57%	1.01	0.52	1	2.1	1	1	4/21/2009	4/11/2016	34	0.267	No Trend	-	-	-	2.1	
LDS	LS3A (Cells 3-5)	Cyanide	ug/L	0	34	0%	-	-	-	-	5	5	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS3A (Cells 3-5)	Selenium	ug/L	0	32	0%	-	-	-	-	1	1	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS3A (Cells 3-5)	Total Organic Carbon	ug/L	1	33	100%	4635	1523	2400	9900	-	-	4/21/2009	1/12/2016	212	0.001	Upward	0.0003	Non-parametric	-	9900	Upward trend in baseline
LDS	LS3A (Cells 3-5)	Vanadium	ug/L	3	32	0%	-	-	-	-	2	2	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS6 (Cells 6-8)	Cobalt	ug/L	5	29	0%	-	-	-	-	5	5	6/17/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS6 (Cells 6-8)	Copper	ug/L	2	33	67%	1.22	0.65	1.05	3.1	1	1	4/21/2009	4/11/2016	39	0.274	No Trend	-	-	-	3.1	
LDS	LS6 (Cells 6-8)	Cyanide	ug/L	2	33	0%	-	-	-	-	5	5	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS6 (Cells 6-8)	Selenium	ug/L	0	32	0%	-	-	-	-	1	1	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS6 (Cells 6-8)	Total Organic Carbon	ug/L	1	33	94%	2235	960	1400	5000	500	1000	4/21/2009	1/11/2016	146	0.012	Upward	-	-	-	5000	Marginal upward trend in baseline
LDS	LS6 (Cells 6-8)	Vanadium	ug/L	3	32	3%	1.02	0.10	1.55	1.55	2	2	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	Only 1 detected result below all RLs
LDS	LS8 (Cells 9-10)	Cobalt	ug/L	3	29	0%	-	-	-	-	5	5	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS8 (Cells 9-10)	Copper	ug/L	2	33	61%	1.18	0.73	1.03	3.5	1	1	4/21/2009	4/11/2016	2	0.494	No Trend	-	-	-	3.5	
LDS	LS8 (Cells 9-10)	Cyanide	ug/L	1	32	0%	-	-	-	-	5	5	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS8 (Cells 9-10)	Selenium	ug/L	1	31	0%	-	-	-	-	1	1	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	All baseline data are nondetects
LDS	LS8 (Cells 9-10)	Total Organic Carbon	ug/L	3	32	81%	1676	782	1430	3300	500	1000	4/21/2009	1/11/2016	66	0.145	No Trend	-	-	-	3300	
LDS	LS8 (Cells 9-10)	Vanadium	ug/L	3	31	3%	1.02	0.13	1.75	1.75	2	2	4/21/2009	4/11/2016	-	-	-	-	-	-	RL	Only 1 detected result below all RLs
T-POND	MW-3795	Benzene	ug/L	0	37	95%	2.86	0.96	1.2	4.3	1	1	9/18/2003	8/29/2018	-183	0.009	Downward	-	Non-parametric	-	4.3	Downward trend in baseline
T-POND	MW-3795	Chlorobenzene	ug/L	0	37	100%	5.22	1.54	1.3	8.8	-	-	9/18/2003	8/29/2018	140	0.034	Upward	0.461	Normal	1.9	8.14	Marginal upward trend in baseline
PLF	MW-5925	Benzene	ug/L	0	56	63%	84.6	173.3	1.095	680	1	1.7	10/13/2004	8/16/2018	-652	0.000	Downward	-	Non-parametric	-	680	Downward trend in baseline
PLF	MW-5925	Chlorobenzene	ug/L	0	56	95%	79.1	96.2	1.2	460	1	1	10/13/2004	8/16/2018	-741	0.000	Downward	-	Non-parametric	-	460	Downward trend in baseline
Ash Pond	MW-6165	Arsenic	ug/L	0	44	100%	98.4	23.5	52.8	164	-	-	11/27/2006	8/24/2018	-128	0.099	No Trend	0.115	Normal	1.87	142	
Ash Pond	MW-6165	Boron	ug/L	0	49	100%	383	76	240	560	-	-	11/27/2006	8/24/2018	-220	0.030	Downward	0.479	Normal	1.86	525	Marginal downward trend in baseline
Ash Pond	MW-6166	Arsenic	ug/L	0	44	70%	1.76	1.14	0.75	4.8	0.745	5	11/27/2006	8/24/2018	-517	0.000	Downward	-	Non-parametric	-	4.8	Downward trend in baseline
Ash Pond	MW-6166	Boron	ug/L	1	51	100%	951	62	830	1100	-	-	11/27/2006	8/24/2018	363	0.002	Upward	0.045	Non-parametric	-	1100	Upward trend in baseline
Ash Pond	MW-6167	Arsenic	ug/L	1	44	59%	0.993	0.585	0.56	2.8	0.745	1	11/29/2006	8/27/2018	365	0.000	Upward	-	Non-parametric	-	2.8	Upward trend in baseline
Ash Pond	MW-6167	Boron	ug/L	0	49	100%	312	23	255	370	-	-	11/29/2006	8/27/2018	-131	0.131	No Trend	0.904	Normal	1.86	355	

Table M-1. Background Statistical Evaluation Results Summary

							Summary Statistics						Sample Date Range		Baseline Data Trend Analysis			Shapiro-Wilk W Test		Upper Prediction Limit (UPL)		
Media	Location	Constituent	Unit	No. of Outliers / Earlier Samples Excluded	No. of Samples Used	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	First Sample Date	Last Sample Date	Mann-Kendall S Statistic	p-value	Trend Test Result	Normality Test p-value	Distribution	*K*-Multiplier	UPL with Retesting Strategy	Note
Ash Pond	MW-6168	Arsenic	ug/L	0	43	63%	1.32	0.90	0.59	3.78	1	5	11/29/2006	5/18/2018	**-126**	**0.083**	**No Trend**	-	Non-parametric	-	**3.78**	
Ash Pond	MW-6168	Boron	ug/L	0	48	100%	364	29	300	460	-	-	11/29/2006	5/18/2018	**49**	**0.334**	**No Trend**	0.019	Non-parametric	-	**460**	
Ash Pond	MW-6169	Boron	ug/L	0	49	100%	348	53	246	490	-	-	11/29/2006	8/27/2018	**-109**	**0.176**	**No Trend**	0.774	Normal	1.86	**447**	
PLF	MW-6174	Benzene	ug/L	1	56	41%	8.83	17.12	0.92	77	1	1	10/13/2004	8/16/2018	**45**	**0.360**	**No Trend**	-	Non-parametric	-	**77**	
PLF	MW-6174	Chlorobenzene	ug/L	1	56	34%	2.96	5.43	0.97	23.5	1	1	10/13/2004	5/30/2018	**109**	**0.173**	**No Trend**	-	Non-parametric	-	**23.5**	
PLF	MW-6174	Chloroform	ug/L	0	56	0%	-	-	-	-	1	5	10/13/2004	8/16/2018	**-**	**-**	**-**	-	-	-	**RL**	All baseline data are nondetects
PLF	MW-6174	Ethylbenzene	ug/L	0	57	0%	-	-	-	-	1	5	10/13/2004	8/16/2018	**-**	**-**	**-**	-	-	-	**RL**	All baseline data are nondetects
LDS	LS 28 (Cells 23-26)	Cobalt	ug/L	1	12	0%	-	-	-	-	5	5	7/6/2015	1/8/2018	**-**	**-**	**-**	-	-	-	**RL**	All baseline data are nondetects
LDS	LS 28 (Cells 23-26)	Copper	ug/L	0	13	54%	5.77	9.78	1.8	29	1	4	6/30/2015	1/8/2018	**-35**	**0.021**	**Downward**	-	Non-parametric	-	**29**	Marginal downward trend in baseline
LDS	LS 28 (Cells 23-26)	Cyanide	ug/L	0	13	0%	-	-	-	-	5	5	6/30/2015	1/8/2018	**-**	**-**	**-**	-	-	-	**RL**	All baseline data are nondetects
LDS	LS 28 (Cells 23-26)	Selenium	ug/L	0	13	23%	1.13	1.12	0.625	4.1	1	3	6/30/2015	1/8/2018	**-**	**-**	**-**	-	Non-parametric	-	**4.1**	
LDS	LS 28 (Cells 23-26)	Total Organic Carbon	ug/L	0	13	100%	4592	3806	2000	16000	-	-	6/30/2015	1/8/2018	**-20**	**0.126**	**No Trend**	0.000	Non-parametric	-	**16000**	
LDS	LS 28 (Cells 23-26)	Vanadium	ug/L	1	12	8%	1.64	0.60	2.7	2.7	2	4	7/6/2015	1/8/2018	**-**	**-**	**-**	-	Non-parametric	-	**2.7**	
SLF SW	001-B	Cobalt	ug/L	0	33	0%	-	-	-	-	5	15	4/3/2009	5/3/2018	**-**	**-**	**-**	-	-	-	**RL**	All baseline data are nondetects
SLF SW	001-B	Copper	ug/L	0	28	96%	5.46	2.83	1.7	12	10	10	4/3/2009	5/3/2018	**15**	**0.193**	**No Trend**	-	Non-parametric	-	**12**	
SLF SW	001-B	Cyanide	ug/L	1	26	8%	2.66	1.12	4.25	7.25	0.005	5.2	4/3/2009	5/3/2018	**-**	**-**	**-**	-	Non-parametric	-	**7.25**	
SLF SW	001-B	Selenium	ug/L	2	30	60%	1.25	0.81	1.1	3.4	1	1	4/3/2009	1/12/2018	**36**	**0.259**	**No Trend**	-	Non-parametric	-	**3.4**	
SLF SW	001-B	Total Organic Carbon	ug/L	0	65	97%	12023	4132	3000	24000	1000	1000	4/20/2000	5/3/2018	**-61**	**0.367**	**No Trend**	-	Non-parametric	-	**24000**	
SLF SW	001-B	Vanadium	ug/L	0	33	33%	2.47	4.15	1.5	23.5	2	10	4/3/2009	5/3/2018	**3**	**0.484**	**No Trend**	-	Non-parametric	-	**23.5**	
SLF SW	001-D	Cobalt	ug/L	2	32	3%	2.59	0.51	5.375	5.375	5	5	4/3/2009	1/12/2018	**-**	**-**	**-**	-	Non-parametric	-	**5.375**	
SLF SW	001-D	Copper	ug/L	1	28	93%	4.53	2.90	1.3	12	4	10	4/3/2009	5/3/2018	**-77**	**0.012**	**Downward**	-	Non-parametric	-	**12**	Marginal downward trend in baseline
SLF SW	001-D	Cyanide	ug/L	0	27	4%	2.48	0.61	4.35	4.35	0.005	5	4/3/2009	5/3/2018	**-**	**-**	**-**	-	Non-parametric	-	**4.35**	
SLF SW	001-D	Selenium	ug/L	0	33	64%	1.65	1.05	1	4.6	1	5	4/3/2009	5/3/2018	**-162**	**0.005**	**Downward**	-	Non-parametric	-	**4.6**	Downward trend in baseline
SLF SW	001-D	Total Organic Carbon	ug/L	0	67	100%	9288	4900	1600	25000	-	-	4/20/2000	5/3/2018	**-88**	**0.319**	**No Trend**	<.0001	Non-parametric	-	**25000**	
SLF SW	001-D	Vanadium	ug/L	1	33	67%	4.95	5.01	1.494	22.25	2	10	4/3/2009	5/3/2018	**-240**	**0.000**	**Downward**	-	Non-parametric	-	**22.25**	Downward trend in baseline
SLF SW	001-E	Cobalt	ug/L	0	33	3%	2.94	1.84	12	12	5	15	4/3/2009	5/4/2018	**-**	**-**	**-**	-	Non-parametric	-	**12**	
SLF SW	001-E	Copper	ug/L	1	27	96%	5.00	2.49	1.2	13	10	10	4/3/2009	5/4/2018	**-4**	**0.424**	**No Trend**	-	Non-parametric	-	**13**	
SLF SW	001-E	Cyanide	ug/L	0	28	4%	2.63	0.69	6.166667	6.166667	5	5	4/3/2009	5/4/2018	**-**	**-**	**-**	-	Non-parametric	-	**6.17**	
SLF SW	001-E	Selenium	ug/L	2	30	37%	0.883	0.601	1	2.6	1	1	4/3/2009	1/12/2018	**-36**	**0.219**	**No Trend**	-	Non-parametric	-	**2.6**	
SLF SW	001-E	Total Organic Carbon	ug/L	0	66	100%	9825	4372	1700	21000	-	-	4/20/2000	5/4/2018	**203**	**0.132**	**No Trend**	0.045	Non-parametric	-	**21000**	
SLF SW	001-E	Vanadium	ug/L	1	32	75%	3.95	3.31	1.525	12.73333	2	10	4/3/2009	5/4/2018	**-131**	**0.016**	**Downward**	-	Non-parametric	-	**12.7**	Marginal downward trend in baseline

Notes:

If duplicates exist, the average of the duplicate results is used as a single data point. Similarly, if more than one samples are collected in the same month, the average result is used.

Nondetects were substituted by half of reporting limit (RL) for the computation of summary statistics.

The UPL with restesting strategy was based on the "1-of-2 Retesting" for intrawell prediction limits on observations and site-wide annual false positive rate of 10% per media (USEPA, 2009, Table 19-10 and Table 19-19). If the initial sample exceeds the UPL, one resample will be collected, and if the resample result exceeds the UPL, the exceedance is confirmed. Otherwise, it is not considered to be an exceedance.

Ash Pond, PLF, T-Pond, were created in 2019 and are referenced as GW#2 in the Statistical Methodology text.