FORM EQP 5111 ATTACHMENT TEMPLATE B5
ENVIRONMENTAL MONITORING PROGRAMS

This document is an attachment to the Michigan Department of Natural Resources and Environment's *Form EQP 5111, Construction Permit and Operating License Applications, Hazardous Waste Treatment Storage and Disposal Facilities.* See the instructions for Form EQP 5111 for details on how to use this attachment. All references to Title 40 of the Code of Federal Regulations (40 CFR) citations specified herein are adopted by reference in R 299.11003.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), R 299.9611 establishes requirements for the environmental monitoring programs for hazardous waste management facilities. Owners and operators of hazardous waste treatment, storage, or disposal facilities must develop an environmental monitoring program capable of detecting a release of hazardous waste or hazardous waste constituents from the facility to groundwater, air, or soil.

This license application template addresses requirements for an environmental monitoring program for hazardous waste management units and the hazardous waste management facility for the Wayne Disposal, Inc. facility. The template includes either a monitoring program description or a demonstration for a waiver from the monitoring requirements in accordance with R 299.9611(3)(a) and (b) and R 299.9611(4) as indicated below:

Groundwater Monitoring Program *(Check as appropriate)*

☒ R 299.9612 compliance monitoring program and sampling and analysis plan for one or more units
☐ Waiver for one or more units

Ambient Air Monitoring Program (Check as appropriate)

☒ Monitoring program and sampling and analysis plan

☐ Waiver

Semi-Annual Soil Monitoring Program (Check as appropriate)

☒ Monitoring program and sampling and analysis plan

☐ Waiver

This template is organized as follows:

B5.A GROUNDWATER MONITORING PROGRAM
- B5.A.3 General Groundwater Monitoring Requirements
  - B5.A.3(a) Sampling and Analysis Plan
  - B5.A.3(b) Description of Wells
  - B5.A.3(c) Procedure for Establishing Background Quality

B5.A.3(d) Statistical Procedures
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B5.A.4(b) Groundwater Monitoring System
B5.A.4(c) Background Concentration Values for Proposed Parameters
B5.A.4(d) Proposed Sampling and Analysis Procedures
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B5.G SEDIMENTATION BASIN MONITORING PROGRAM
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B5.H LEACHATE MONITORING PROGRAM
B5.H.1 Sampling and Analysis Plan
B5.I Radiological Monitoring Plan
B.I.1 Sampling and Analysis Plan

B5.A GROUNDWATER MONITORING PROGRAM

[R 299.9611(2)(b) and (3), R 299.9612, and R 299.9629 and 40 CFR, Part 264, Subpart F, except 40 CFR §§264.94(a)(2) and (3), (b), and (c), 264.100, and 264.101]

Attachment B5.A Sampling and Analysis Plan of the Operating License Application describes the facility's unit-specific groundwater monitoring program. The basis for determining the groundwater monitoring program for each unit described below is provided in the Attachment B3 Hydrogeological Report, attached separately to this application, which was prepared in accordance with R 299.9506.

B5.A.3 General Groundwater Monitoring Requirements

[R 299.9612 and 40 CFR §§264.97 and 264.91(b)]

The WDI facility will comply with the requirements for a groundwater monitoring program by implementing the program developed to satisfy the requirements of R 299.9612 and R 299.9629 and 40 CFR §§264.98 and 264.99, except 40 CFR §§264.94(a)(2) and (3) and 264.94(b) and (c). The basis for determining the groundwater monitoring program for each unit is provided in Attachment B3 Hydrogeologic Report, of this application that was prepared in accordance with R 299.9506.

B5.A.3(a) Sampling and Analysis Plan

[R 299.9611(2)(a)]

A sampling and analysis plan (SAP) for groundwater monitoring at WDI is included in Attachment B5.A Groundwater Sampling and Analysis plan. The sampling and analysis plan was prepared in accordance with the requirements specified in R 299.9611(2)(a). All sampling and analysis performed pursuant to this application will be consistent with the SAP. All samples for the purpose of environmental monitoring will be collected, transported, stored, and disposed of by trained and qualified individuals in accordance with the SAP.

B5.A.3(b) Description of Wells

[R 299.9612 and 40 CFR §264.97(a), (b), and (c)]

The Hydrogeological Report provides documentation that the groundwater monitoring program contains a sufficient number of wells, installed at appropriate depths to yield groundwater samples from the uppermost aquifer that (1) represent the quality of background water that has not be affected by leakage from a regulated unit; (2) represent the quality of groundwater passing the point of compliance; and (3) allow for detection of contamination when hazardous constituents have migrated from the waste management area to the upper aquifer.

B5.A.3(c) Procedure for Establishing Background Quality

[R 299.9612 and 40 CFR §264.97(a)(1) and (g)]

Procedures for establishing background groundwater quality are described in Attachment B5.A Groundwater Sampling and Analysis plan.

B5.A.3(d) Statistical Procedures
[R 299.9612 and 40 CFR §§264.97(h) and 264.97(i)(1), (5), and (6)]

Statistical procedures for evaluating groundwater quality are described in Attachment B5.A Groundwater Sampling and Analysis plan

B5.A.4 Detection Monitoring Program
[R 299.9612 and 40 CFR §§264.91(a)(4) and 264.98]

The basis for determining the detection monitoring program for each unit is provided in Attachment B3 Hydrogeologic Report, of this application that was prepared in accordance with R 299.9506.

B5.A.4(a) Indicator Parameters, Waste Constituents, and Reaction Products
[R 299.9506(3)(a) and (f), R 299.9506(4)(a), and R 299.9612 and 40 CFR §264.98(a)]

The monitoring parameter list is provided in Attachment B3 Hydrogeologic Report.

B5.A.4(b) Groundwater Monitoring System
[R 299.9612 and 40 CFR §§264.97(a)(2), (b), and (c) and 264.98(b)]

Refer to Section B5.A.3(a)

B5.A.4(c) Background Concentration Values for Proposed Parameters
[R 299.9612 and 40 CFR §§264.98(c) and 264.97(g)(1) and (2)]

Refer to Sections B5.A.3(b) and (c)

B5.A.4(d) Proposed Sampling and Analysis Procedures
[R 299.9506(3)(e) and R 299.9612 and 40 CFR §§264.97(d), (e), and (f) and 264.98(d), (e), and (f)]

Refer to Section B5.A.3(a) and (b)

B5.B AMBIENT AIR MONITORING PROGRAM
[R 299.9611(2)(c) and (4)]

B5.B.1 Sampling and Analysis Plan
[R 299.9611(2)(a)]

A sampling and analysis plan for ambient air monitoring is included B5.B Ambient Air Monitoring, which was prepared in accordance with the requirements specified in R 299.9611(2)(a). All sampling and analysis performed pursuant to this application will be consistent with the Ambient Air Monitoring Plan.

The WDI facility will conduct ambient air monitoring to detect concerns of the provisions of Part 55 of Act 451.

B5.C SEMI-ANNUAL SOIL MONITORING PROGRAM
[R 299.9611(2)(d) and (4)]

B5.C.1 Sampling and Analysis Plan
[R 299.9611(2)(a)]

Attachment B5.C Soil Monitoring Sampling and Analysis Plan provides for semi-annual soil monitoring requirements. The sampling and analysis plan was prepared in accordance with the requirements specified in R 299.9611(2)(a). All sampling and analysis performed pursuant to this application will be consistent with SM SAP.

B5.D LEAK DETECTION COLLECTION & REMOVAL SYSTEM MONITORING PROGRAM

B5.D.1 Sampling and Analysis Plan

A sampling and analysis plan monitoring WDI's leak detection collection and removal system Attachment B5.D Leak Detection Collection and Removal System Sampling and Analysis (LDCRS). All sampling and analysis performed pursuant to this application will be consistent with this plan.

B5.E LYSIMETER MONITORING PROGRAM

B5.E.1 Sampling and Analysis Plan

A lysimeter sampling and analysis plan (SAP) for annual lysimeter monitoring for WDI is included in Attachment B5.E. All sampling and analysis performed pursuant to this application will be consistent with this plan.

B5.F SURFACE WATER MONITORING PROGRAM

B5.F.1 Sampling and Analysis Plan

A sampling and analysis plan (SW SAP) for quarterly surface water monitoring for WDI is included in Attachment B5.F. All sampling and analysis performed pursuant to this application will be consistent with this plan.

B5.G SEDIMENTATION BASIN MONITORING PROGRAM

B5.G.1 Sampling and Analysis Plan

A sampling and analysis plan (SB SAP) for annual sedimentation basin monitoring for WDI is included in Attachment B5.G. All sampling and analysis performed pursuant to this application will be consistent with the plan.

B5.H LEACHATE MONITORING PROGRAM

B5.H.1 Sampling and Analysis Plan

A sampling and analysis plan for leachate monitoring for WDI is included in Attachment B5.H. All sampling and analysis performed pursuant to this application will be consistent with the plan.

B5.I Radiological Monitoring Plan

B5.I.1 Sampling and Analysis Plan

Attachment B5.I provides information on WDI's radiological monitoring program. Sampling and analysis is completed utilizing procedures identified in the Environmental Radiological Monitoring Plan provided with Attachment B5.I.

Groundwater Sampling and Analysis Plan
Wayne Disposal Inc.

MID 048 090 633

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Attachment C Chain of Custody & Monitoring Well Damage Report
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Attachment J Field Measurement Equipment and Procedures
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Attachment L Statistical Monitoring Plan for Ground Water Monitoring

I. Introduction

40 CFR, Part 264.97 requires the owner or operator of a hazardous waste facility to develop and follow a consistent program of groundwater sampling and analysis procedures. The program must include procedures and techniques for:

1) sample collection;
2) sample preservation and shipment;
3) analytical procedures; and
4) chain of custody control.

This sampling and analysis plan (SAP) has been developed to direct the groundwater program at the Wayne Disposal, Inc. (WDI) hazardous waste landfill to meet the requirements of applicable rules. Some of the wells are also subject to monitoring under the TSCA requirements of 40 CFR, Part 761.75. All sampling personnel must follow the procedures in the SAP. Any proposed changes to this SAP must be submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for review and approval prior to implementation.

II. General Description

The current groundwater monitoring system for WDI consists of 27 wells, numbered 18, 19R, 20 through 22, 23AR, 24, 25, 26A, 27A, 28 through 30, 31AR, 32, 36 through 40R, and 47 through 53. Wells numbered 1A through 16, 26, 27, 31 and 41 through 46 also exist at the site but are not included in the groundwater monitoring sampling network for the hazardous waste management area of WDI. Wells OB-21, OB-23R, OB-24, OB-40R, and OB-48 through OB-53 are also monitored under the Toxic Substances Control Act (TSCA) per conditions contained in 40 CFR 761.75. Most of the wells are screened within the glacial sand aquifer beneath the clay till in which the landfill cells are constructed. Several wells are screened in the upper portion of the bedrock, which is a weathered shale. Well locations indicating the aquifer zone in which the screened interval is completed are shown on Attachment A.

For Master Cells (MC) VI-F&G, a two-phase monitoring system is being implemented to account for the construction of future landfill cells. Construction of the MC VI-F&G began with the Woodlot (MC VI-G Phase 1). During this initial construction, a line of wells was installed south of the MC VI-G, Phase I. As shown on Attachment A, this set of wells is designated as OB-49 through OB-53. Well OB-51 required relocation approximately 215 feet west of the original well as part of WDI's 2019 transfer area relocation. The well was redesignated OB-51A to document it as a relocated well. Four of the new wells (OB-50, OB-51A, 52, and OB-53) were installed in the sand aquifer and one well (OB-49) was installed in the bedrock.

When construction of cells on top of Master Cell 1 begins, the three initial phase wells (OB-50 through OB-52) will be properly decommissioned as this area is within the footprint of the landfill. Additional wells will be installed (or re-designated) at the downgradient (i.e., south) side of Master Cell 1. There are already four wells (OB-6, OB-8, OB-12R, and OB-13) installed along the south border of Master Cell 1 as part of the solid waste groundwater monitoring program for Master Cell 1. These four wells will be re-designated as dual hazardous waste and

solid waste monitoring wells, and four new monitoring wells (OB-54, OB-55, OB-58, and OB-59) will be installed to complete the monitoring well network. The proposed locations of these wells are shown on Attachment A. Prior to installing these wells, the proposed locations will be reviewed with EGLE to determine if any adjustments to the plan are warranted.

As new wells are installed, they must be sampled four times to establish an intrawell minimum background concentration for all primary and secondary parameters prior to waste being placed in the cell (or phase of cell) that will be monitored by the new well. If possible, these four samples should be collected quarterly to provide suitable background variance and temporal variability. If the four initial background samples are collected on an accelerated schedule (i.e., less than one sample per quarter), the background statistics should be recomputed after four quarterly samples have been collected, assuming of course, that there is no evidence of impact by waste or waste constituents at the time. In this case, the purpose of recalculating the background statistics after four quarterly events is to incorporate temporal variability and the reduce the potential for autocorrelation of the data from the four initial sampling points.

Copies of the well logs for all of WDI's wells are included in Attachment B. As new wells are added or abandoned, Attachments A, B and E must updated and the updates submitted to the EGLE.

III. Laboratory

Analyses of samples from the wells are conducted by a contract laboratory. Currently, Pace Analytical Laboratories is the contract laboratory. Analytical arrangements and sample bottle preparation can be ordered in advance by calling the contract laboratory. If WDI decides to contract analysis of groundwater samples to another laboratory, EGLE will be notified, and the change will be made only after at least two concurrent sampling/analysis events show adequate correlation of analytical results between the existing and proposed contract laboratories.

IV. Required Documentation

Documentation required for this monitoring program includes:

a) A field notebook must be utilized to record all pertinent field data and sampling information during every sampling event. Field notes must include the name(s) of sampling personnel, sample date, sample time, sample location, depth to standing water in the well, calculations for determining the volume of water to be purged from the well prior to sampling, results of any field measurements on groundwater samples and observations of sample characteristics or the sampling environment. Any odors, colors, sheens, or other unusual characteristics of the samples must be described in detail. Copies of these field data notes must be included in reports sent to EGLE.

b) During each sampling event, a Monitoring Well Inspection Log must be filled out and filed with the Site Environmental Manager. A copy of this form is included as Attachment C-2. This report must be filled out to note any conditions of the monitoring wells or surrounding area that needs maintenance or repairs.

c) An equipment inventory, repair and calibration log is maintained in the Engineering Field Office. This log is used to list the inventory (by serial number) of all sampling apparatus and field measurement devices. Any changes of equipment or repairs to equipment must be noted in this log, as well as daily instrument calibrations, etc.

d) Standard chain of custody (COC) forms from the contract laboratory are also required for the sampling process. An example copy of a COC is included herein as Attachment C-1. The COC must be filled out fully for each sample submitted for analysis as described in Section X.

V. Standing Water Level Measurements

To obtain the an accurate measurement of static water levels for the site, 1) the levels must be obtained for all wells listed on Attachment E before any water is removed for purging or sampling, and 2) the levels must be obtained for all wells in as short a time as possible (on the same day), to limit changes due to barometric pressure effects. Generally static water levels for the wells are determined at least 30 days after the wells were last sampled ensuring water levels reach static elevations.

The depth to standing water within the well casing is measured from the top of casing (TOC). The top of the well casing is exposed by removing the white plastic Well Wizard™ well heads. The surveyed point on the casing is always at the edge on the north side of the casing. Additionally, there is a permanent mark on the north side of the casing which marks the edge from which water levels are to be taken. The TOC elevations shall be surveyed at least once every two years to verify accuracy. Removal of the well head is necessary for determination of the standing water level. The depth to water is measured using an electric water level indicator. Attachment D describes the operating procedures for the water level indicator, which is used for this purpose.

When using the water level indicator, the probe and submersed portion of the cable must be cleaned with distilled/deionized water and a clean cloth, followed by a distilled/deionized water rinse. This must be done prior to the measurement at each well to prevent potential cross contamination between wells. The probe should be lowered into the casing slowly while watching for the light. The water level should be carefully determined by raising and lowering the probe at the water surface and monitoring the light and buzzer. When the depth to water has been carefully determined, the distance from the point on the cable at TOC to the nearest marking on the cable within the well casing should be recorded. The markings on the cable should be scaled in 0.01-foot intervals so measurements should be recorded to the nearest 0.01 foot. The depth to standing water is then the distance from the probe tip at the water level to the marking on the cable. Record this depth in the field notebook.

VI. Well Purging

Before purging a well, it is 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 to the well screen. The depth to standing water must be determined just prior to beginning sample

collection. The depth to bottom of each well is listed on Attachment E as "Well Depth". Currently, all the wells are constructed with 2-inch diameter casing. The difference between depth to the bottom of the screen and depth to water level is the height of water standing within the well. This height of water is multiplied by 0.17 gallons per foot (for 2-inch diameter well casing) and that product is multiplied by 3, the number of standing volumes to be purged, which is the minimum recommended by EGLE. The resultant product is the total quantity to be purged from the well, in gallons. If any future well is not constructed of 2-inch diameter casing, this calculation must be amended to account for the volumetric difference due to well diameter. For 2-inch diameter wells:

Amt. purged (in gallons) = (Ht. of standing water) x 0.17 x 3

Record these calculations in the field notebook.

While not frequently necessary, well depths should be checked if a change in well yield or sample appearance (i.e., excess turbidity) is noted. If the total well depth needs to be confirmed, the dedicated pump assemblies should be carefully removed and the water level indicator probe should be lowered to the bottom of the well casing for a determination of the clear depth of the well (make sure that the indicator cable is cleaned between each well). A change in well yield is identified by an increase in the time it takes to complete the purging process compared to the wells historical performance. If the purge time increases by 25% compared to normal, the well should be sounded to make sure that the change in well yield is not due to silting-in. If the water after purging is completed is cloudy or siltier than the normal appearance, this also may be indicative of silting in and the well should be sounded. If there is evidence of silting in based on the sounding, the well will need to be redeveloped or possibly replaced. When sounding a well, it is very important to ensure that the pump and tubing are kept clean when removed from the well (i.e., do not place equipment on ground, rather, wrap in plastic sheeting).

Following the removal of three standing well volumes, measure and record the pH and specific conductance of the water coming from the well. Continue to record these values at a rate of once every 10 minutes. After three values of pH and specific conductance have been obtained in this manner, compare the highest and lowest values. If the difference between the highest and lowest pH value is 0.07 su or less, the well is considered stabilized with respect to pH. If the difference between the highest and lowest specific conductance values is 18 µmhos/cm or less, the well stabilization is considered complete. If the difference between the highest and lowest values for either parameter exceeds these criteria, pump the well another 10 minutes and recheck both parameters. Perform the comparison again, using only the last three monitored values of pH and specific conductance. Once the criteria are satisfied for any three consecutive monitored values of both pH and specific conductance, then consider the well fully stabilized and proceed with sampling. Upon stabilization of pH and specific conductance, the well water temperature should also be recorded. Record in the field notebook all the data obtained to establish well stabilization.

In cases where an individual well cannot be purged to stabilization in a manner described above because the well becomes fully dewatered, then sample the well after completely dewatering (evacuating) the well four times. For each sampling event, the second, third and fourth well evacuations should be performed within three days of the initial well evacuation. Sampling

should be accomplished as soon after the fourth well evacuation as possible, depending upon the rate at which the water level in the well recovers. Fully record in the field notebook all instances of well evacuation. For wells that purge dry, measure and record pH, specific conductance, and temperature in the field at the time the sample is obtained. Field measurements should be measured after sample bottles have been filled to ensure a complete sample for laboratory analysis prior to measurement of field parameters.

Currently, all wells are outfitted with the Well Wizard™ system of dedicated pumps. This means that each well has a submersible pump within it, with the pump intake generally located within the screened interval. The control unit and cylinders of compressed nitrogen (or another source of compressed gas needed to operate the pumps) are the other components that complete this system. Because sampling immediately follows the purging step in nearly all cases, the controlled-atmosphere sampling box (if used) must be prepared during well purging. The controlled-atmosphere sample box is discussed in greater detail in Section VII, below.

Prior to a sampling round for the wells, replace the sampling box discharge tube. To set up the Well Wizard™ system for operation, connect the nitrogen cylinder hose or other source of compressed gas to the supply port on the controller unit. Connect one end of the coiled tubing within the controller unit to the Drive Air Out Port on the unit, and the other end to the smaller of the two ports on the well head assembly. If using the sampling box, connect the water sample line from the larger of the two well head ports to the back of the sampling box. Make certain that the valve on the rear of the box directs flow out of the box and through the discharge tube, until well purging is completed.

To initiate purging, begin the flow of nitrogen or other compressed gas into the controller. The quantity of water purged from the well should be measured using a bucket with known volume and marked with gradations. Note that all purged water should be discharged on the ground away from the well. Do not allow the purged water to re-enter the well or the well protective casing. Water should not be allowed to pond around the well. Further background on Well Wizard™ operation can be gained by referring to Attachment F. Any problems with equipment function should be reported to the Site Environmental Manager.

VII. Sample Collection

Upon completion of the well purging step, or upon return to a well which has been evacuated four times for purging, samples are collected. Make sure each sample bottle for a given monitoring well has a label (affixed by the analytical laboratory personnel) which contains our facility name, the monitoring well number, the date, and the sampler's initials. If a preservative has been included by the laboratory, such a note also should appear on the label.

In past sampling programs, it has been shown that airborne artifacts from disposal operations and engine exhaust can affect the number of detected constituents and their concentrations within groundwater samples. For this reason, a controlled-atmosphere sampling box was constructed and has been used in the collection of groundwater samples. Nitrogen, under positive pressure, is used as the sampling atmosphere within the box, thereby minimizing the probability of impacts to sample quality by airborne artifacts (e.g., dust and vapors). As site operations have progressed,

most of the samples can now be collected at a safe distance from active landfill operations and the sampling box is optional for those locations.

If the sampling box is used, prepare for sampling by connecting the nitrogen cylinder to the sampling box and purge the box atmosphere with nitrogen for 20 to 30 minutes. Make certain that all sample bottles to be used at a given location are placed within the box prior to purging the box atmosphere. Remove the caps from the bottles during the purging process to expose the interior of the bottles to the nitrogen environment. A new laboratory grade tygon tube connecting the wellhead to the sampling box or the area where the bottles are filled must be used for the collection of samples from each location. When using the sample box, turn the valve on the rear of the sampling box, diverting the flow of water from the discharge tube to the sampling tube within the box.

If the sampling box is not used, the sample bottles are staged on a clean surface and the caps are left on until each bottle is opened for filling. An air compressor is used instead of nitrogen for operating the Well Wizard™ equipment. The compressor should be stationed downwind and as far as practicable from the well during purging and sampling. It is important to note atmospheric conditions such as wind-blown dust and odors in the field notebook when sampling outside the box. If the sampling vehicle is nearby, the engine should be off and/or downwind of the sampling area during sample collection. A new, laboratory grade Tygon™ tube connecting the wellhead to the area where the bottles are filled must be used for the collection of samples from each location.

Samples for volatile organic compounds . Make certain not to touch the inside of bottle necks or caps with your hands. Next, the bottles for total organic carbon, total phenolics, metals and then other miscellaneous parameters are filled, in this order. Each sample bottle is filled to the very top and allow minimal headspace (air bubbles when capped and tipped) and care should be taken not to spill any of the preservatives. The number and type of samples taken and the time of sampling is recorded on the chain of custody record.

Trip blanks (VOC vials filled with laboratory “clean” water) shall accompany the sample containers every day that samples are collected. A trip blank is provided by the laboratory for each batch of sample bottles (usually one for each cooler). These remain unopened throughout the sampling day and are submitted with the sample bottles. A field blank shall also be collected at each well sampled. A field blank is an empty (except for preservative) VOC vial that is opened in the nitrogen sampling box (if used) or the atmosphere and filled with laboratory provided “clean” water while that well is being sampled. The purpose of the field blank is to replicate the sampling environment in all ways except for the source of water in the container. Both kinds of blanks should be preserved, handled and shipped exactly as the well samples are. All the trip blanks and a minimum of one field blank for each ten samples will be analyzed on a random basis for the primary parameters. However, if a positive result for any primary parameter is noted in a given well, the matching field blanks must be analyzed for the offending parameter(s). In addition to field and trip blanks, a complete replicate/duplicate sample shall be obtained from one well, chosen randomly and labeled with an “X,” during each sampling round. The replicate/duplicate sample will be analyzed for the same parameters as the sample it replicates.

VIII. Sample Preservation and Shipments

Attachment G is a tabulation of sample preservation procedures. The samples must be preserved in accordance with the procedures outlined in this attachment. For all samples, the laboratory provides clean, pre-preserved bottles (where necessary). Samples to be analyzed for dissolved metals must be field filtered with a 0.45 μm in-line filter cartridge and preserved with reagent grade HNO_3 to a pH of less than 2.

When the sample collection step is completed, the sampling box (if used) is opened, and all the sample bottles are transferred to a cooler packed with sufficient ice to maintain the temperature near 4 degrees Celsius. After each well is sampled, the tubing for the sampling box (if used) is replaced with new tubing and the chain of custody record is completed.

All collected samples and blanks must be stored in a secure location until delivery to the contract laboratory personnel. This means within sight of sampling personnel or locked in a secure location. Chain of custody records must accompany the samples at all times. The handling of these forms is covered in the Chain of Custody Control portion of this document (Section X).

IX. Analytical Procedures

The parameters to be analyzed as part of the monitoring program for the uppermost aquifer wells are shown in Attachment H.

Specific analytical procedures and target detection limits, consistent with the current Policy and Procedure Document OWMRP-111/115-8 and used by the contract laboratory for this monitoring program are tabulated in Attachment I. However, when changes to analytical methods or to the detection limits contained within OWMRP-111/115-8 are published and made available, the contents of Attachment I must be updated accordingly, or EGLE approval must be attained for any alternate target detection limits. Further, Attachment I should be reviewed periodically to determine if the laboratory has made changes that should be reflected in the attachment. Quality assurance/quality control (QA/QC) frequencies, as well as precision and accuracy calculations are included in the QA/QC manual. Changes made to detection limits, analytical methods, or QA/QC in response to regulatory requirements must be included in an updated SAP.

Field measurements of specific conductance, pH, and temperature will be performed using the equipment and procedures described in Attachment J or equipment of similar capabilities. The instruments must be calibrated prior to each day of use and the appropriate notation made in the Equipment Inventory, Repair and Calibration Log described in Section IV.

The current Quality Assurance Manual is provided in Attachment K. This manual describes the internal policies, guidelines, and procedures that laboratories used by WDI must meet in order to be utilized for analytical work. This plan may be periodically updated and is used to audit contract laboratories to ensure that generally acceptable practices are employed.

X. Chain of Custody Control

Chain of Custody refers to the record of individuals and external conditions of sample handling through the time of laboratory analysis. The sample COC record included as Attachment C is the principal document of this record. These sheets are fully filled out with sampling information as well as the persons involved and shipment conditions during transport to the analytical laboratory. These sheets accompanies the samples to the laboratory.

When the samples are surrendered at the laboratory, each COC record must be signed by the person transporting the samples as well as a representative of the receiving laboratory. The lab will make a copy of each sheet for us and keep the originals. The copy must be maintained in the files. Upon completion of a full round of sampling, the depth to standing water information, field monitoring data, and all COC records will be transmitted to the Site Environmental Manager.

XI. Equipment and Well Maintenance

Equipment used for the collection and analysis of groundwater samples must be maintained in working order and replaced or repaired promptly when necessary. Electrodes for pH and specific conductance should be replaced if they become difficult to calibrate or appear to malfunction. The dedicated Well Wizard™ pumps and associated equipment require no routine maintenance but should be promptly replaced or repaired in the event of a malfunction. Any pump removed from a well should be thoroughly cleaned before replacement. Tubing removed from the well should be packaged and stored to prevent contamination or replaced. As outlined in Section IV, records of instrument calibration and any equipment replacement or repair must be kept in the Equipment Log maintained at the Engineering field office.

The well casings, protective covers, and Well Wizard™ pump heads should be inspected for damage at the time of each well sampling. Any damage should be noted in the field notebook and a Monitoring Well Inspection/Damage Report must be filled out and sent to the Site Environmental Manager. A copy of this form is included as Attachment C-2. It is important to note any surface erosion, standing water at the well, or evidence of a damaged grout seal around the well.

In the event any damage requiring well repair becomes necessary, a Damage Incident Report will be prepared by the Site Environmental Manager. A copy of this report will be placed in the Groundwater Monitoring Operating Log at the site. A proposed method of well repair will be prepared and submitted to the EGLE for approval. Repair efforts will be undertaken after approval by the EGLE is received. EGLE shall then be notified at least 24 hours prior to initiating the repair efforts. Following completion of the well repairs, as-built documentation of the repair efforts will be prepared. A copy of the as-built documentation shall be placed in the Groundwater Monitoring Operating Log and a copy sent to the EGLE.

XII. Statistical Evaluation and Reporting Requirements

All ground water analyses for the uppermost aquifer wells must be evaluated for evidence of statistically significant increases in concentrations of all primary and secondary monitoring parameters as described in Attachment L.

The analytical reports, the records of the field procedures, and a report of the statistical analyses (narrative and tabular) must be submitted to EGLE within 60 days of completing each sampling event. This report will also include a summary of the review of QA/QC data, a narrative of the sampling event including dates and sampling personnel, and a description of any unusual events or conditions encountered. Copies of the analysis and report must be maintained in designated files at the administration office at the site. In addition, an annual report summarizing the groundwater monitoring results as well as an evaluation of groundwater flow directions and rates for the uppermost aquifer must be submitted to EGLE by March 1 of the following year.

Attachment A

Groundwater Monitoring Well Location Map

(Site II - WDI/MDWTP)

E 4.000 E 5.000 E 6.000 E 7.000 E 8.000 E 9.000

N 8.000 N 7.000 N 6.000

OB-40-R OB-19-R OB-18 OB-31-AR OB-31-A OB-32 OB-7 OB-4 OB-1-A OB-48 OB-30 OB-38 OB-27-A OB-29 OB-26-A OB-28 OB-39 OB-42 OB-43 OB-41 OB-53 OB-49 OB-50 OB-51-A OB-52 OB-20 OB-3 OB-11-A OB-37 OB-25 OB-58 OB-59 OB-21 OB-36 OB-47 OB-15 OB-22 OB-24 OB-23-A OB-5 OB-14 OB-16 OB-54 OB-9 OB-10 OB-44 OB-45 OB-2-A OB-46 OB-8/OB-60 OB-55 OB-12-R OB-6/OB-56 OB-13/OB-57

NEW CELL BOUNDARY LOCATION
OLD CELL BOUNDARY LOCATION
PROPERTY LINE LOCATION
EXISTING CONTOUR (2 FT INTERVAL)
EXISTING STRUCTURE / BUILDING
PAVED GRAVEL EXISTING ROAD
GRID COORDINATES

LEGEND:

OB-54 PROPOSED MC VI F/G WELL LOCATIONS
OB-54 WELLS COMPLETED IN SAND AQUIFER
OB-54 WELL COMPLETED IN BEDROCK

NOTES:

1. THE BASE MAP WAS CREATED USING AN AERIAL SURVEY TAKEN IN FEBRUARY 03, 2025.
   UPDATED WITH FLYOVER FROM MARCH 31, 2025..

SCALE 0' 100' 200' 400'

DATE:	04-14-25
DESIGNED BY:	XZ
DRAWN BY:	BDA
CHECKED BY:	AN
APPROVED BY:	XZ

CTI and Associates, Inc.
28001 Cabot Drive, Ste. 250
Novi, Michigan 48377
248.486.5100 (fax)248.486.5050
www.ctiomplanies.com

The information contained in this drawing is the property of CTI and Associates, Inc. It is not to be used in whole or in part for any purpose not specifically authorized by CTI and Associates, Inc. in writing. Unauthorized use of this drawing without the express written consent of CTI and Associates, Inc. will be prosecuted to the fullest extent of the law.

REV	DATE	REVISION DESCRIPTION	DRN	APP

WAYNE DISPOSAL SITE NO. 2
WAYNE, MICHIGAN

GROUNDWATER MONITORING WELL LOCATION MAP

PROJECT NUMBER 23L023
SCALE 1" = 200'
DRAWING NO 01

TIME PLOTTED: 11:20:08 AM
DATE PLOTTED: 4/14/2025
FILENAME: C:\Shared\Box\Commercial\US Ecology\WDI\CAD\Site\Monitoring Plans\GROUNDWATER MONITORING WELL LOCATION MAP (20250414).dgn

DRAWING SIZE: 24" X 36"

Attachment B

WDI Ground Water Monitoring Well Logs

Attachment B

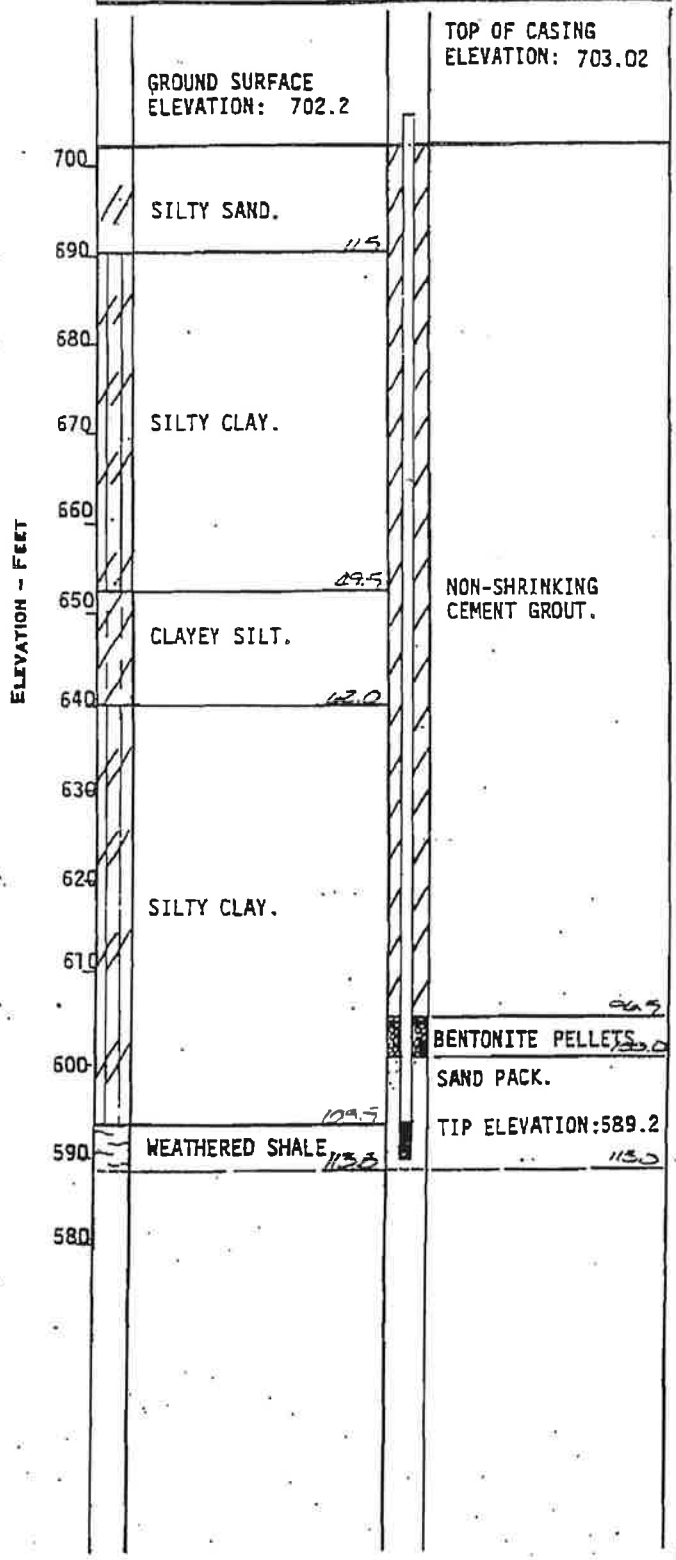
WDI Ground Water Monitoring Well Logs

(WDI)

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
9-24-84	654.69	
10-22-84	653.22	

CASING – DIAMETER: 2.0"
– LENGTH: 108.0'
– MATERIAL: PVC

SCREEN – DIAMETER: 2.0"
– LENGTH: 5.0"
– MESH: .006" slot
– MATERIAL: PVC

WELL STARTED: 9-11-84
WELL COMPLETED: 9-11-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American Drilling
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface strata see Log of Test Boring No. OB-18.
2. Top of casing elevations and ground surface elevations provided by Wayne Disposal, Inc.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL No. OB-18

LANDFILL SITE NO. 2

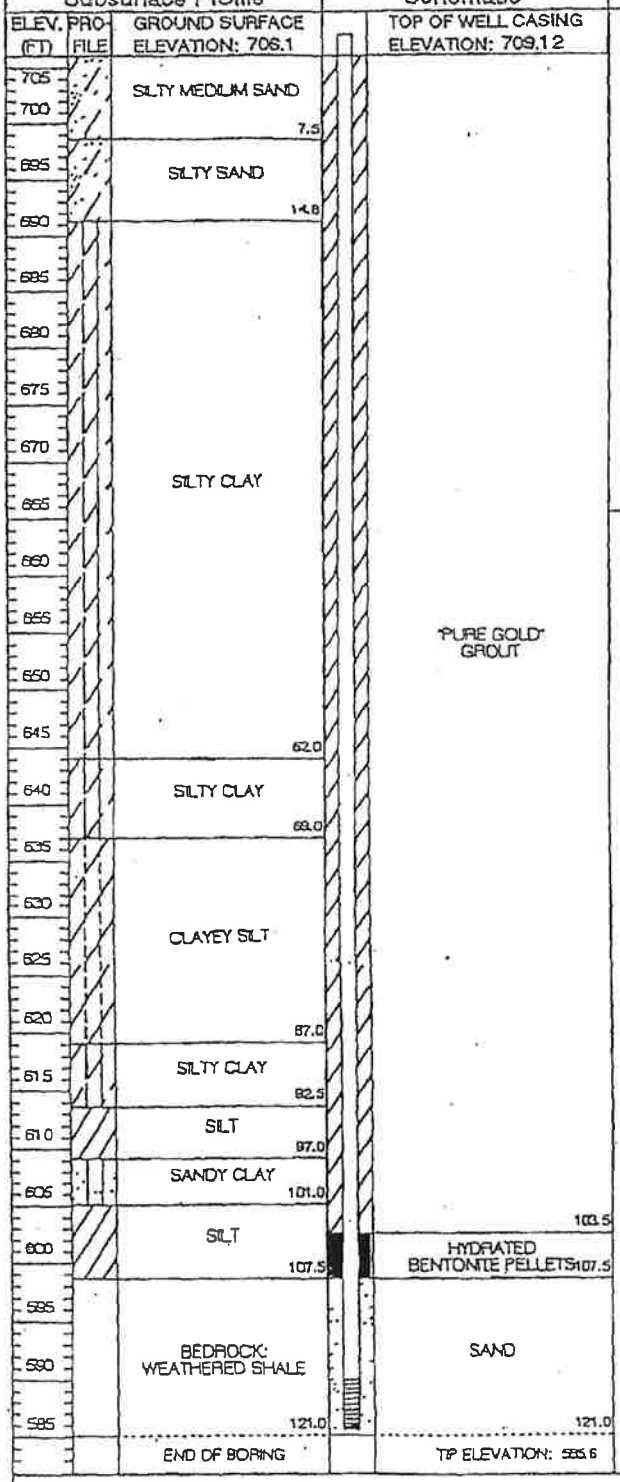
NTH Consultants, Ltd.

MONITORING WELL NO. OB-19R

Project Name : WAYNE DISPOSAL LANDFILL - SITE NO. 2 — NTH Proj. No: 13-3051 01.

Project Location : VAN BUREN TWP., WAYNE COUNTY, MICHIGAN — Checked By : ACE

LOG OF MONITORING WELL



GROUNDWATER DATA

Date	Ground-water Elev.(ft)	Comments
12/01/94	654.50	Before Development

NOTES:

[1] FOR DETAILS OF SUBSURFACE STRATA FROM 0-90', SEE LOG OF TEST BORING OB-19; FOR 90-121', SEE LOG OF TEST BORING OB-19R

[2] TOP OF CASING & GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC

[3] WELL LOCATION: 6873.2 N, 5324.4 E

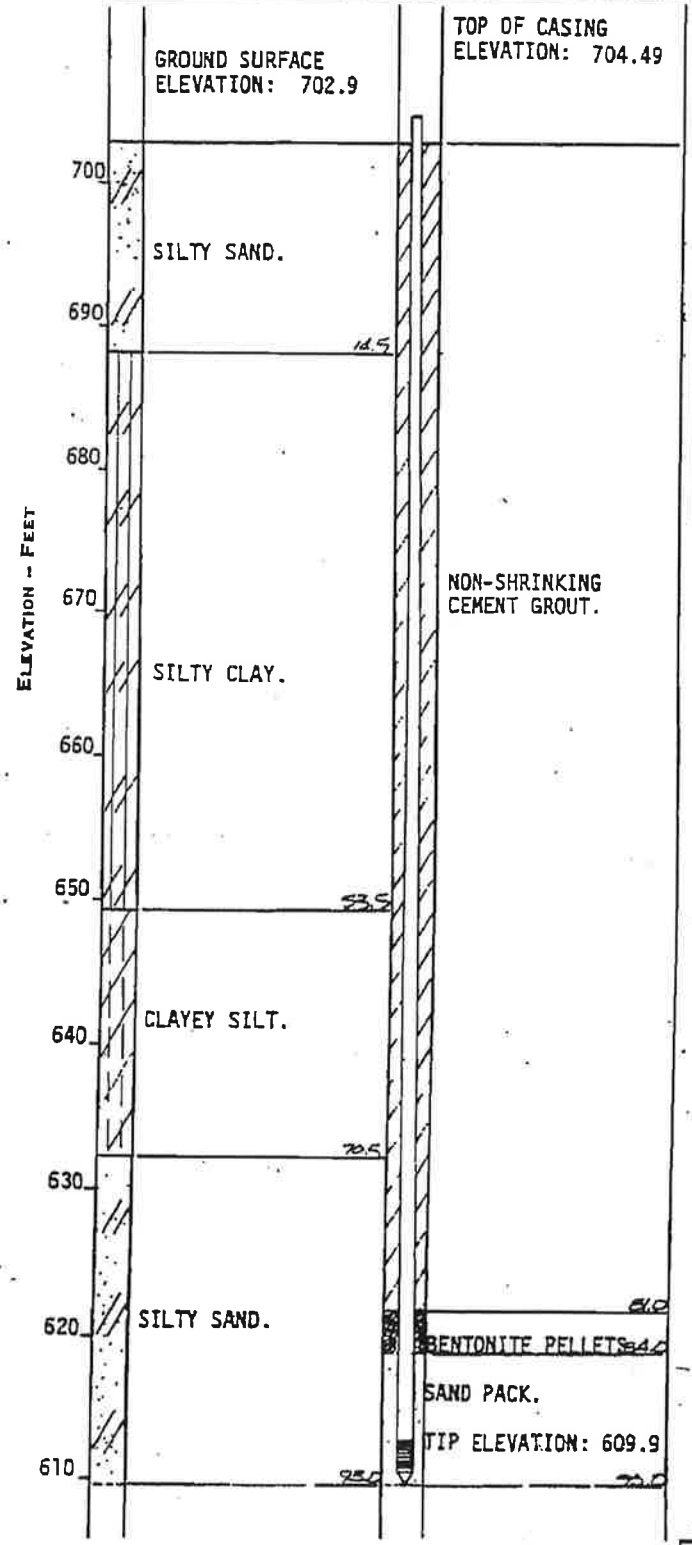
Started:	11/22/94	Casing Diameter:	2.0"
Completed:	11/22/94	Casing Length:	118.0'
Inspector:	R. LEE	Casing Type:	STAINLESS STEEL
Driller:	G. QUALLS	Screen Diameter:	2.0"
Contractor:	GEO-TEK, INC.	Screen Length:	5.0'
Equipment:	CME-850 ALL-TERRAIN DRILL RIG	Screen Mesh:	0.010"
Well Type:	MONITORING	Screen Type:	STAINLESS STEEL

Figure No. A-2

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
9-12-84	653.24	
9-24-84	653.13	

CASING – DIAMETER: 2.0"
– LENGTH: 90.0'
– MATERIAL: Galvanized

SCREEN – DIAMETER: 2.0"
– LENGTH: 3.0'
– MESH: .007" slot
– MATERIAL: Stainless Steel

WELL STARTED: 8-1-84
WELL COMPLETED: 8-2-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American Drilling
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface stra see Log of Test Boring No. OB-20.
2. Top of casing elevations and groun surface elevations provided by Way Disposal, Inc.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

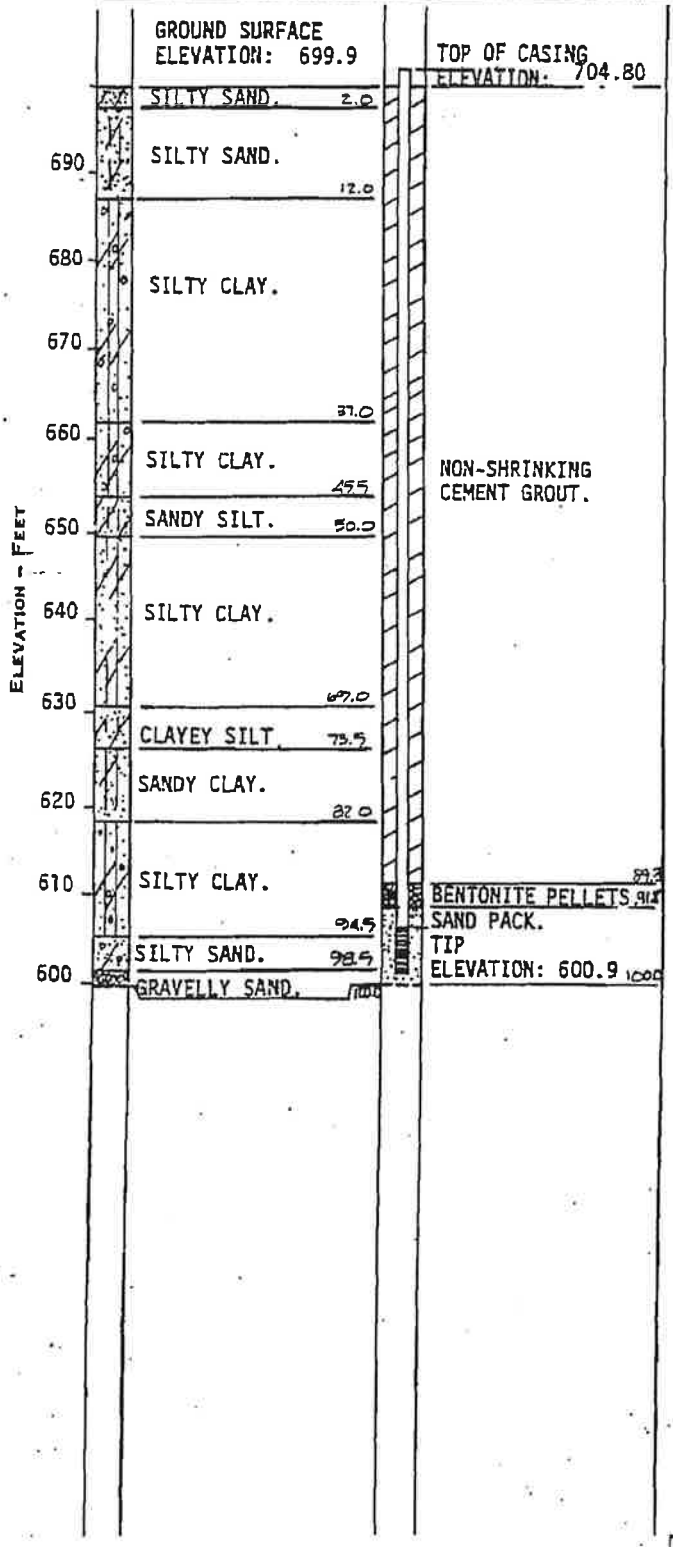
GROUNDWATER MONITORING WELL No. OB-20

WAYNE DISPOSAL LANDFILL SITE NO. 2
VAN BUREN TOWNSHIP

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
9-12-84	652.64	
9-24-84	652.64	
10-22-84	652.44	

CASING – DIAMETER: 2.0"
– LENGTH: 94.0'
– MATERIAL: PVC

SCREEN – DIAMETER: 2.0"
– LENGTH: 5.0'
– MESH: .006" slot
– MATERIAL: PVC

WELL STARTED: 7-23-84
WELL COMPLETED: 7-24-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American Drilling
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface strat see Log of Test Boring No. OB-21.
2. Top casing elevations and ground surface elevations provided by Wayn Disposal, Inc.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

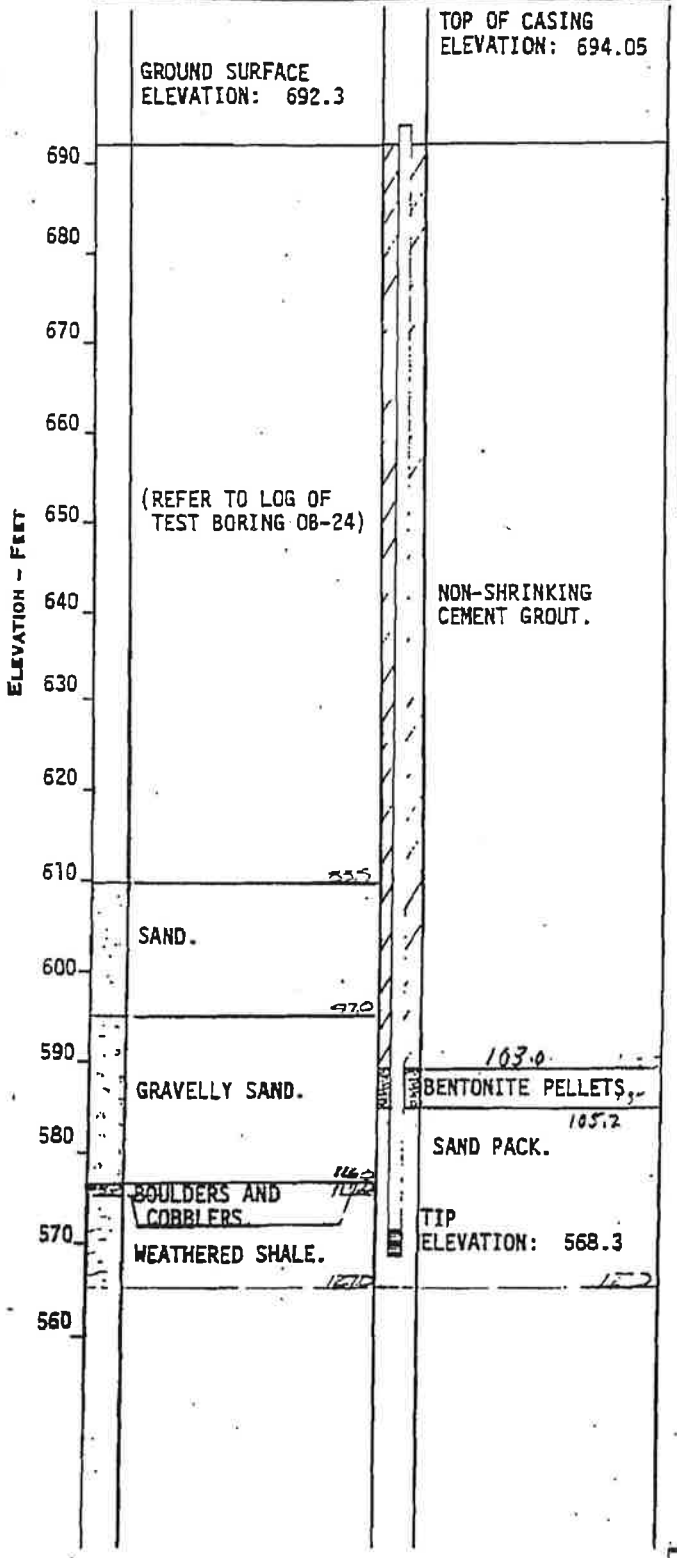
GROUNDWATER MONITORING WELL NO. OB-21

WAYNE DISPOSAL LANDFILL SITE NO. 2
VAN BUREN TOWNSHIP

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUNDWATER ELEV. (FEET)	COMMENTS
9-24-84	654.24	
10-22-84	653.32	

CASING – DIAMETER: 2.0"
– LENGTH: 119.0
– MATERIAL: PVC

SCREEN – DIAMETER: 2.0"
– LENGTH: 5.0'
– MESH: .006" slot
– MATERIAL: PVC

WELL STARTED: 9-14-84
WELL COMPLETED: 9-14-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface strat see Log of Test Boring No. OB-22.
2. Top of casing elevations and ground surface elevations provided by Wayn Disposal, Inc.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL No. OB-22

WAYNE DISPOSAL LANDFILL SITE NO. 2
VAN BUREN TOWNSHIP

Project No:

Well ID: OB-23AR

Project: Well Re-Location

Client: Wayne Disposal, Inc.

Enclosure:

Location: Site No. 2 Belleville, MI

Engineer: M. Takacs

SUBSURFACE PROFILE					
Depth	Symbol	Description	Depth/Elev.	Well Construction	Remarks
0		Ground Surface	0		
5		***sand:*** fine gray, silty with trace gravel and clay	700		
10			12		
15			688		
20					
25					
30					
35					
40					
45					
50		***Clay:*** gray, silty with trace sand and gravel			Casing 2" Stainless Steel
55					
60					
65					
70					
75					
80					
85					
90					
95			95		
100			605		
105					
110		***Sand:*** gray, medium to coarse with trace gravel			Annular Space pH neutral grout
115					
120					Screen 5 foot 2" diameter
125			125		Stainless Steel 7 Slot
130		***Shale:*** gray, weathered	571		

Drilled By: American Drilling

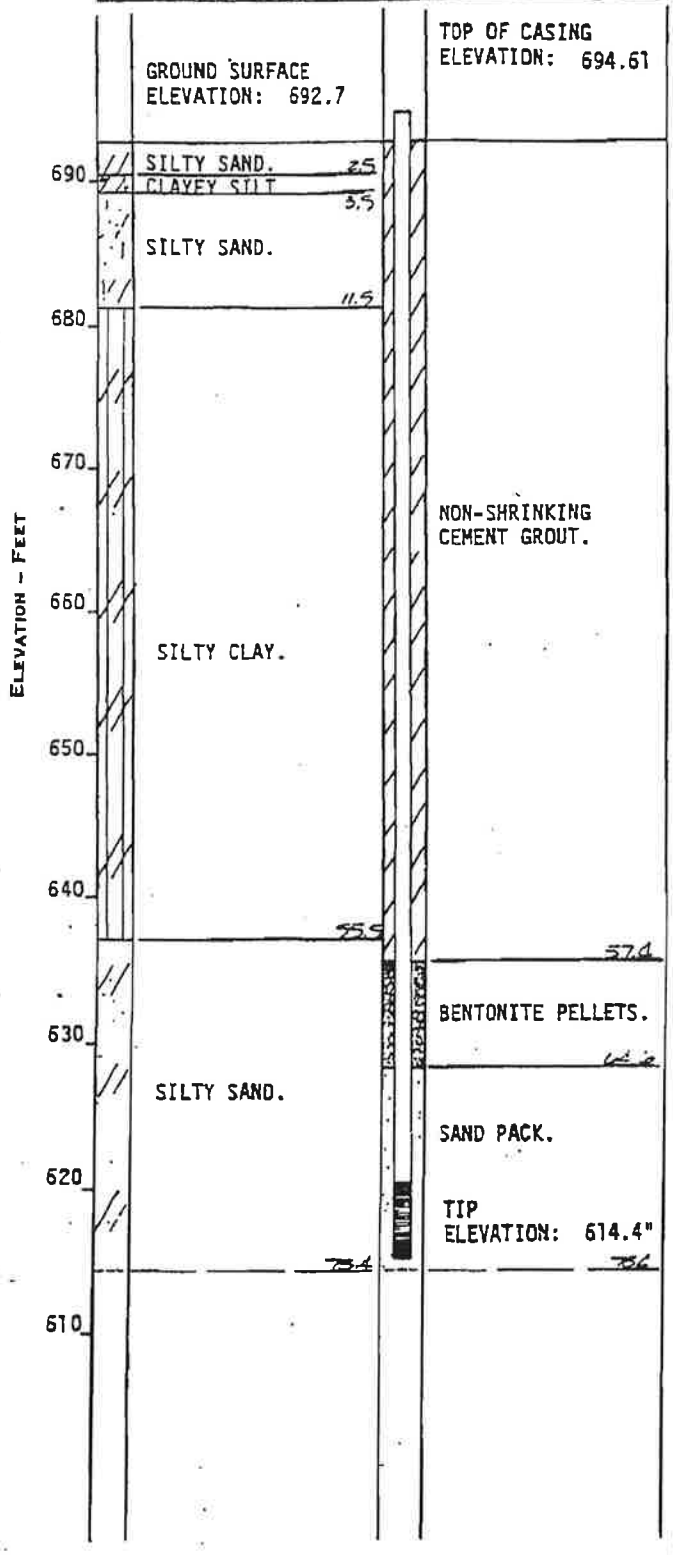
Drill Method: 6.25 inch HSA to EOB

Sheet: 1 of 1

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
9-12-84	653.62	
9-24-84	653.67	
10-22-84	653.30	

CASING - DIAMETER: 2.0"
- LENGTH: 73.3'
- MATERIAL: PVC

SCREEN - DIAMETER: 2.0"
- LENGTH: 5.0'
- MESH: .006" slot
- MATERIAL: PVC

WELL STARTED: 7-24-84
WELL COMPLETED: 7-24-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American Drilling
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface strat see Log of Test Boring No. OB-24.
2. Top of casing elevations and ground surface elevations provided by Wayn Disposal, Inc.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

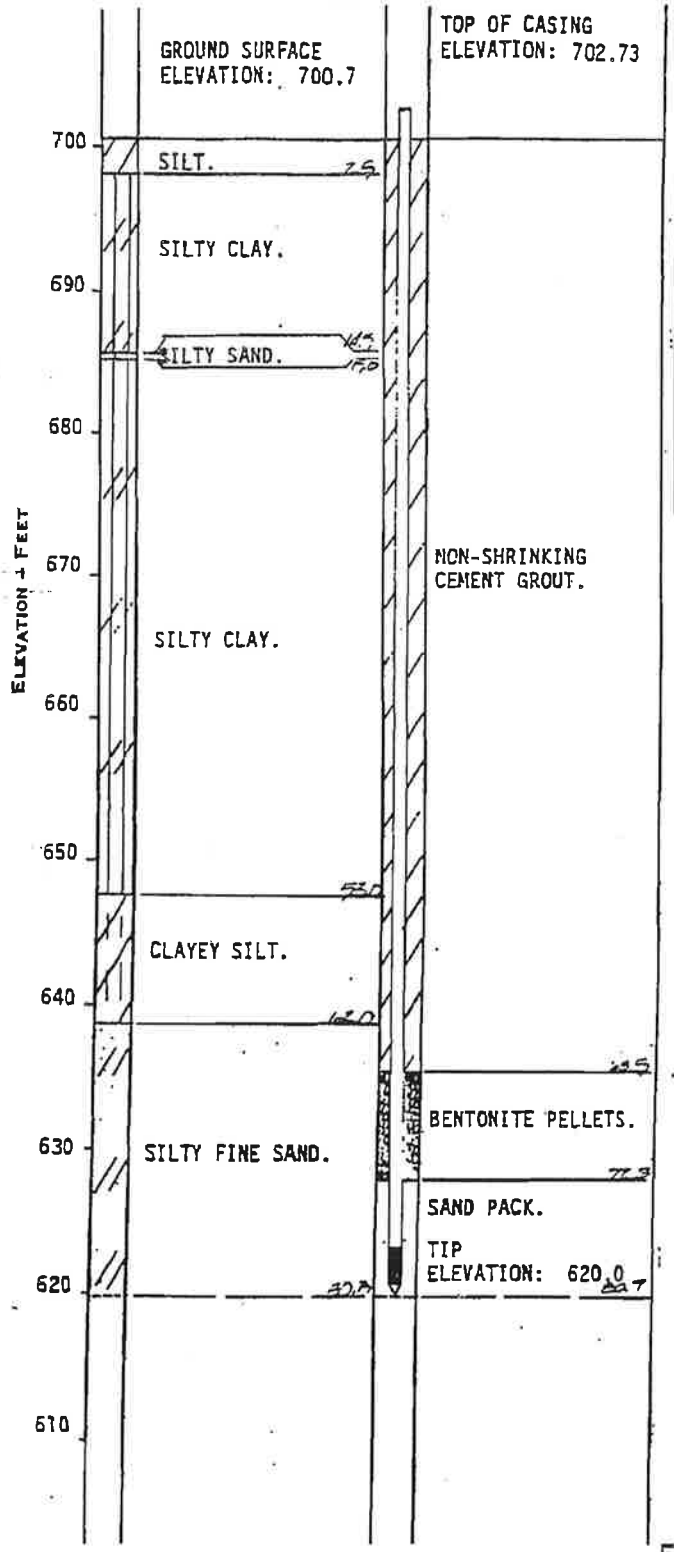
GROUNDWATER MONITORING WELL No. OB-24

WAYNE DISPOSAL LANDFILL SITE NO. 2

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
9-12-84	653.50	
9-24-84	653.86	
10-22-84	653.51	

CASING – DIAMETER: 2.0"
– LENGTH: 77.7
– MATERIAL: Galvanized

SCREEN – DIAMETER: 2.0"
– LENGTH: 3.0'
– MESH: .007" slot
– MATERIAL: Stainless Steel

WELL STARTED: 8-25-84
WELL COMPLETED: 8-25-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American Drilling
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface strat. see Log of Test Boring No. OB-25.
2. Top of casing elevations and ground surface elevations provided by Wayne Disposal, Inc.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL NO. OB-25

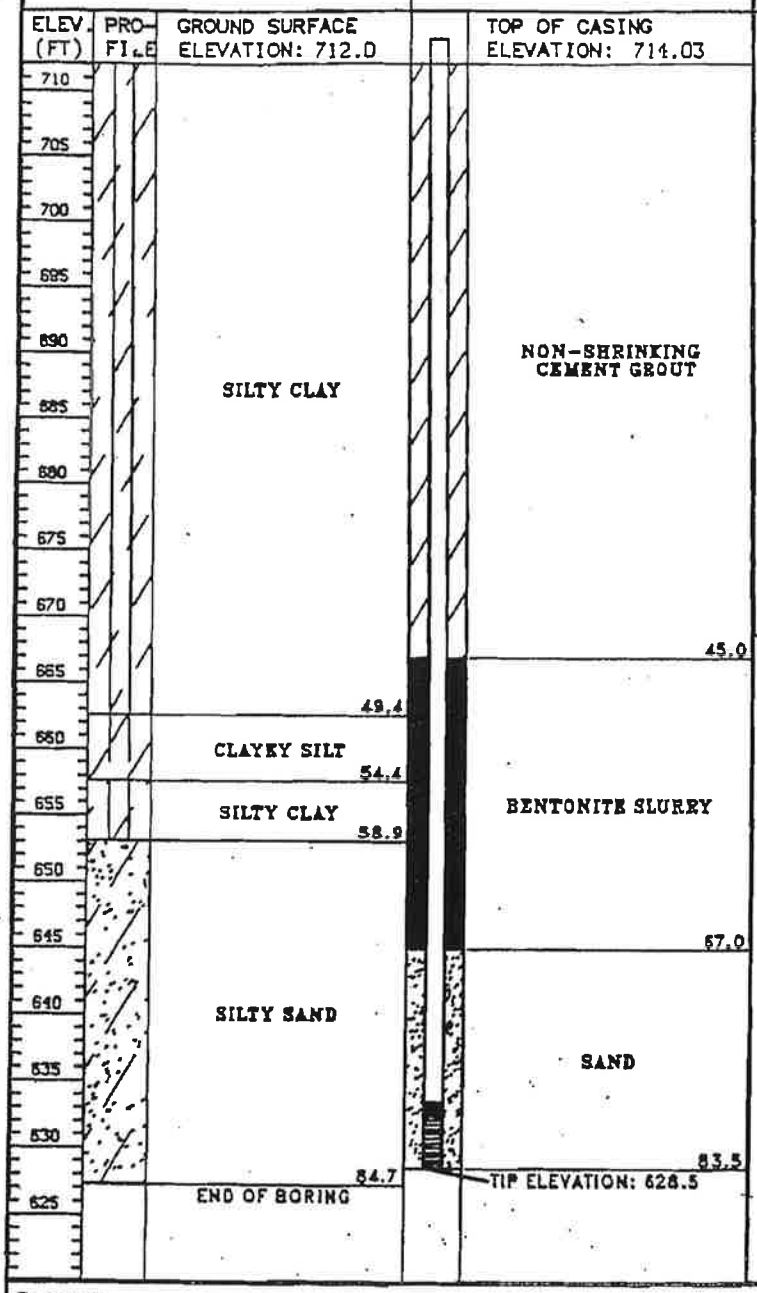
WAYNE DISPOSAL LANDFILL SITE NO. 2
VAN BUREN TOWNSHIP

NEYER, TISEO & HINDO, LTD.

MONITOR WELL NO. OB-26A

Project Name: WAYNE DISPOSAL LANDFILL – SITE NO. 2 — NTH Pro. No. 94315 OW
Project Location: VAN BUREN TWP., WAYNE COUNTY, MICHIGAN — Chk. By: RLB

LOG OF MONITOR INSTALLATION



GROUNDWATER DATA

Date	Groundwater Elev. (ft)	Comments
9/23/87	650.69	
9/24/87	650.62	
9/25/87	650.42	
9/28/87	650.58	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-26
[2] TOP OF CASING AND GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

Started:	9/18/87
Completed:	9/21/87
Inspector:	R. BURNS
Driller:	S REMPALSKI
Contractor:	MATECO DRILLING COMPANY
Equipment:	CME-550
Observation Type:	MONITORING WELL

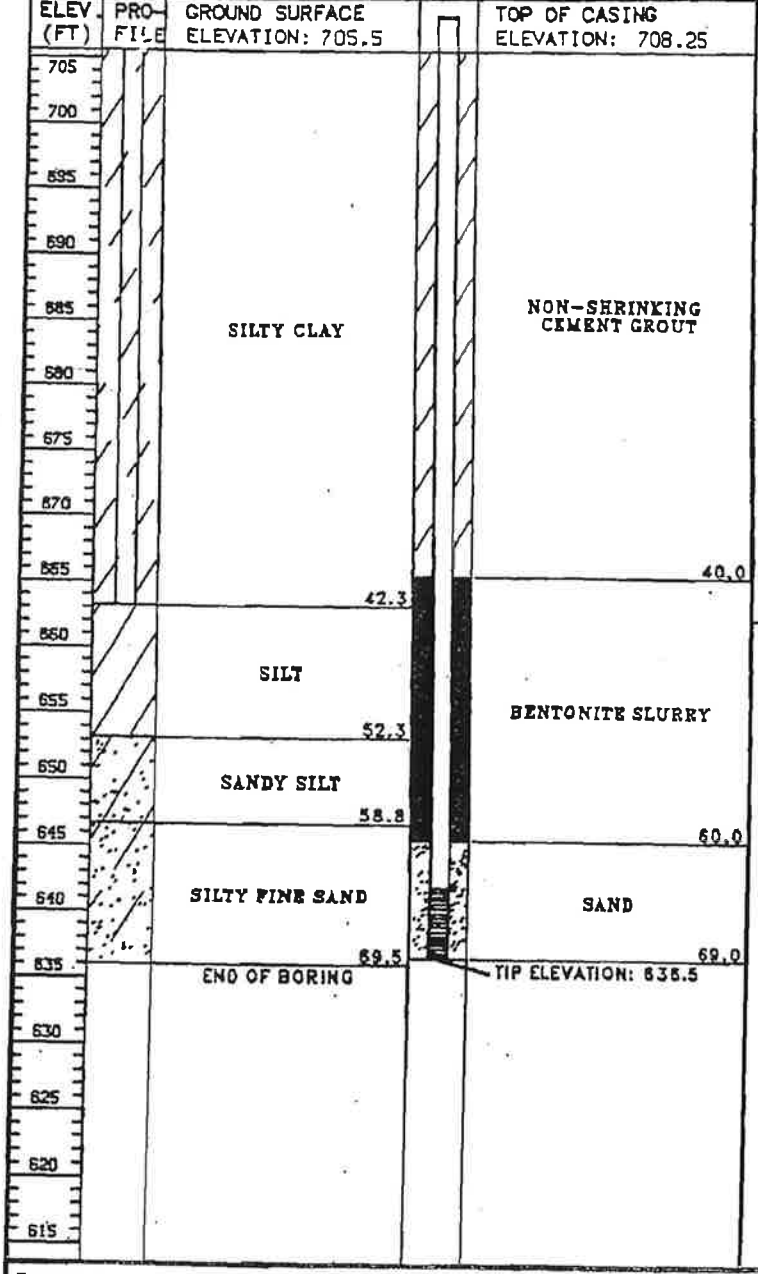
Casing Diam.:	2"
Casing Length:	80.5'
Casing Type:	60.5' GALV. / 20' SS
Screen Diam.:	2"
Screen Length:	5'
Screen Mesh:	0.01"
Screen Type:	STAINLESS STEEL

NEYER, TISEO & HINDO, LTD.

MONITOR WELL NO. OB-27A

Project Name: WAYNE DISPOSAL LANDFILL – SITE NO. 2 — NTH Pro. No. 94315 OW
Project Location: VAN BUREN TWP., WAYNE COUNTY, MICHIGAN — Chk. By: RLB

LOG OF MONITOR INSTALLATION



GROUNDWATER DATA

Date	Groundwater Elev. (ft)	Comments
10/7/87	658.75	
10/23/87	650.49	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-27
[2] TOP OF CASING AND GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

Started: 10/5/87
Completed: 10/5/87
Inspector: R. BURNS
Driller: S. REMPALSKI
Contractor: MATECO DRILLING COMPANY
Equipment: CME-550
Observation Type: MONITORING WELL

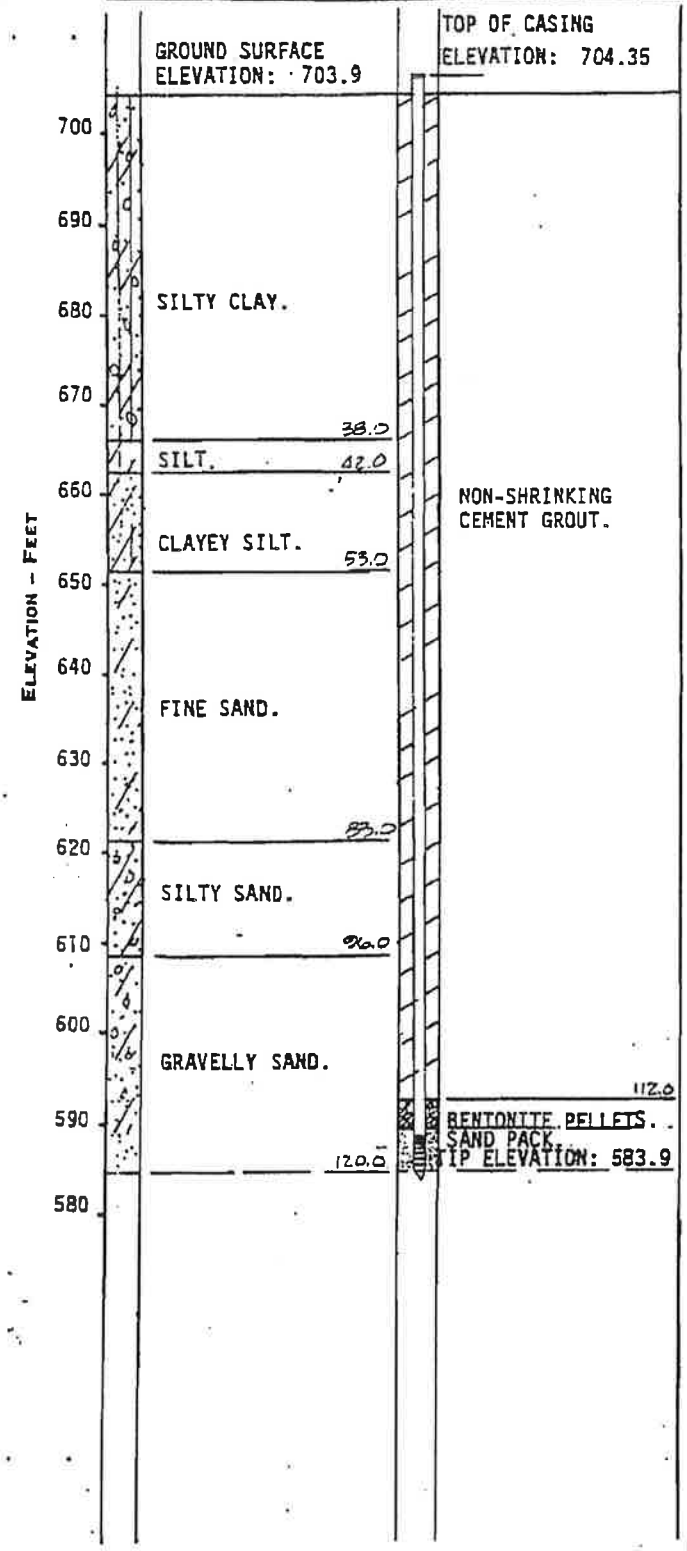
Casing Diam.: 2"
Casing Length: 67'
Casing Type: 47' GALV. / 20' SS
Screen Diam.: 2"
Screen Length: 5'
Screen Mesh: 0.01"
Screen Type: STAINLESS STEEL

Figure No. 10

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
9-12-84	653.60	
9-24-84	653.69	
10-22-84	653.54	

CASING – DIAMETER: 2.0"
– LENGTH: 117.0
– MATERIAL: Galvanized

SCREEN – DIAMETER: 2.0"
– LENGTH: 3.0'
– MESH: .007" slot
– MATERIAL: Stainless Steel

WELL STARTED: 8-13-84
WELL COMPLETED: 8-14-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American Drilling
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface stra see Log of Test Boring No. 28.
2. Top of casing elevations and groun surface elevations provided by Way Disposal, Inc.

115?

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

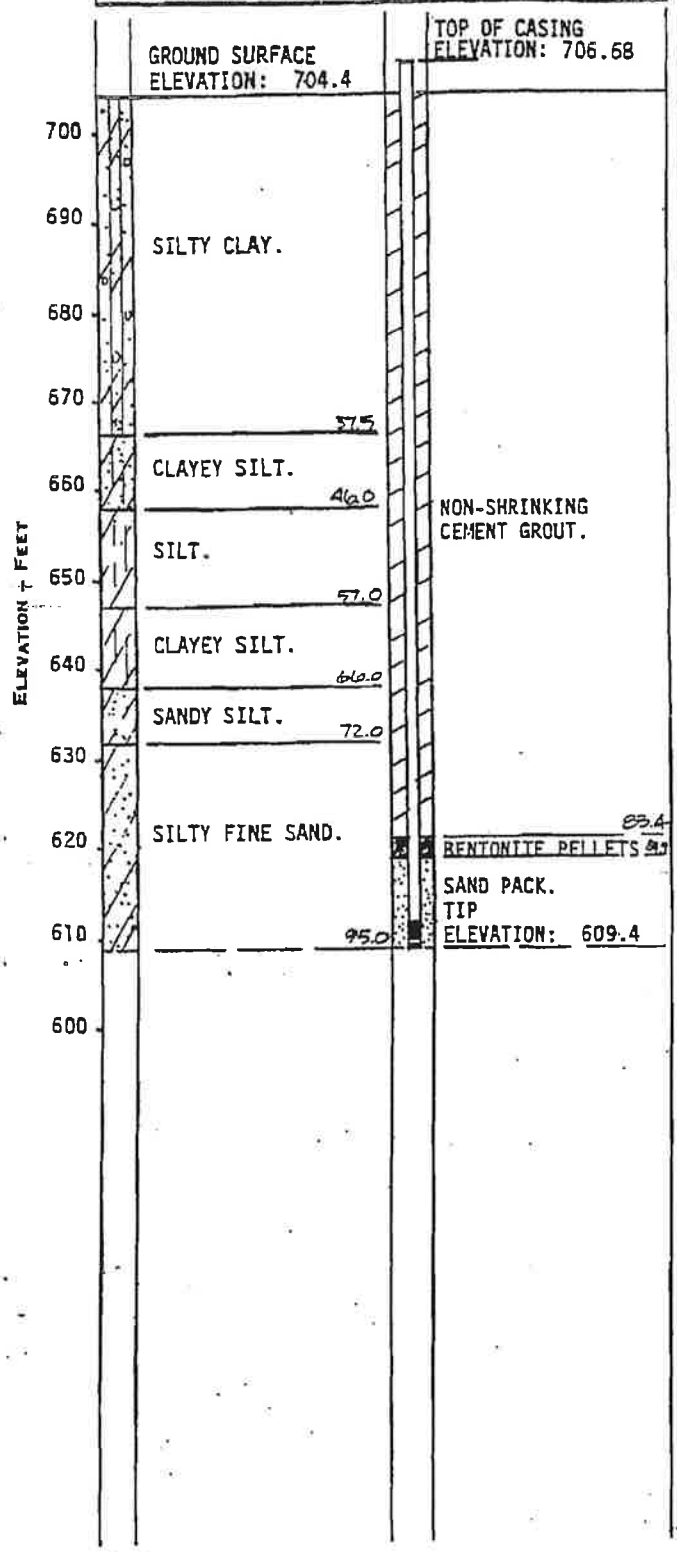
GROUNDWATER MONITORING WELL NO. DR-28

WAYNE DISPOSAL LANDFILL SITE NO. 2
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUND-WATER ELEV. (FEET)	COMMENTS
9-12-84	653.61	
9-24-84	653.63	
10-22-84	653.36	

CASING – DIAMETER: 2.0"
– LENGTH: 90.0'
– MATERIAL: PVC

SCREEN – DIAMETER: 2.0"
– LENGTH: 5.0'
– MESH: .006" slot
– MATERIAL: PVC

WELL STARTED: 7-30-84
WELL COMPLETED: 7-30-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American Drilling
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface stra see Log of Test Boring No. OB-29.
2. Top of casing elevations and groun surface elevations provided by Wa Disposal, Inc.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

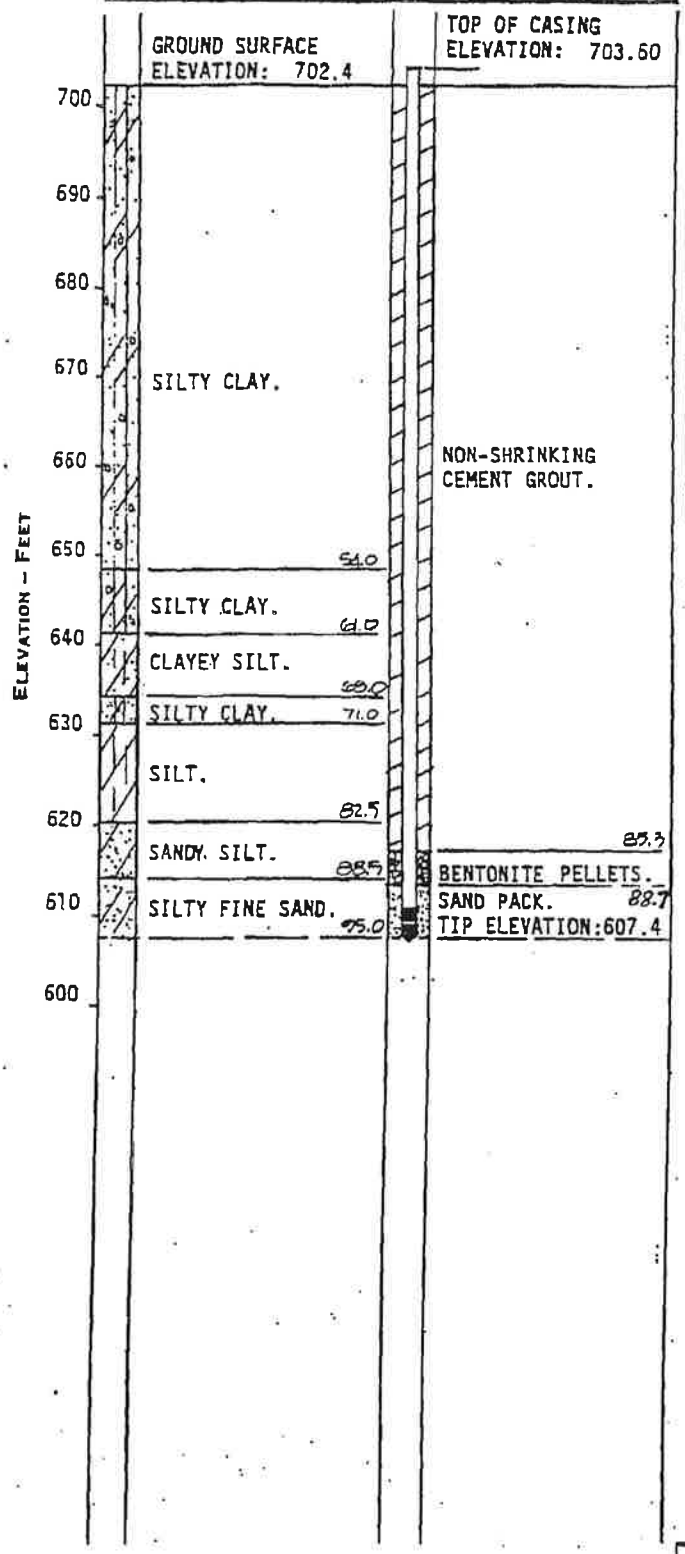
GROUNDWATER MONITORING WELL No. OB-29

WAYNE DISPOSAL LANDFILL SITE NO. 2
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

LOG OF GROUNDWATER MONITORING WELL

CLASSIFICATIONS BY:
NEYER, TISEO & HINDO, LTD.

GENERALIZED SUBSURFACE PROFILE | WELL SCHEMATIC



GROUNDWATER DATA

DATE	GROUNDWATER ELEV. (FEET)	COMMENTS
9-12-84	653.61	
9-24-84	653.81	
10-22-84	653.38	

CASING – DIAMETER: 2.0"
– LENGTH: 92.0'
– MATERIAL: Galvanized

SCREEN – DIAMETER: 2.0"
– LENGTH: 3.0'
– MESH: .007" slot
– MATERIAL: Stainless Steel

WELL STARTED: 8-29-84
WELL COMPLETED: 8-29-84
INSPECTOR: J. Serwik
DRILLER: J. Blank
CONTRACTOR: American Drilling
EQUIPMENT: CME-75

NOTES:
1. For details of the subsurface stra see Log of Test Boring No. OB-30.
2. Top of casing elevations and groun surface elevations provided by Way Disposal, Inc.

NEYER, TISEO & HINDO, LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL NO. OB-30

WAYNE DISPOSAL LANDFILL SITE NO. 2
VAN BUREN TOWNSHIP
WAYNE COUNTY, MICHIGAN

DATE: 10-8-84

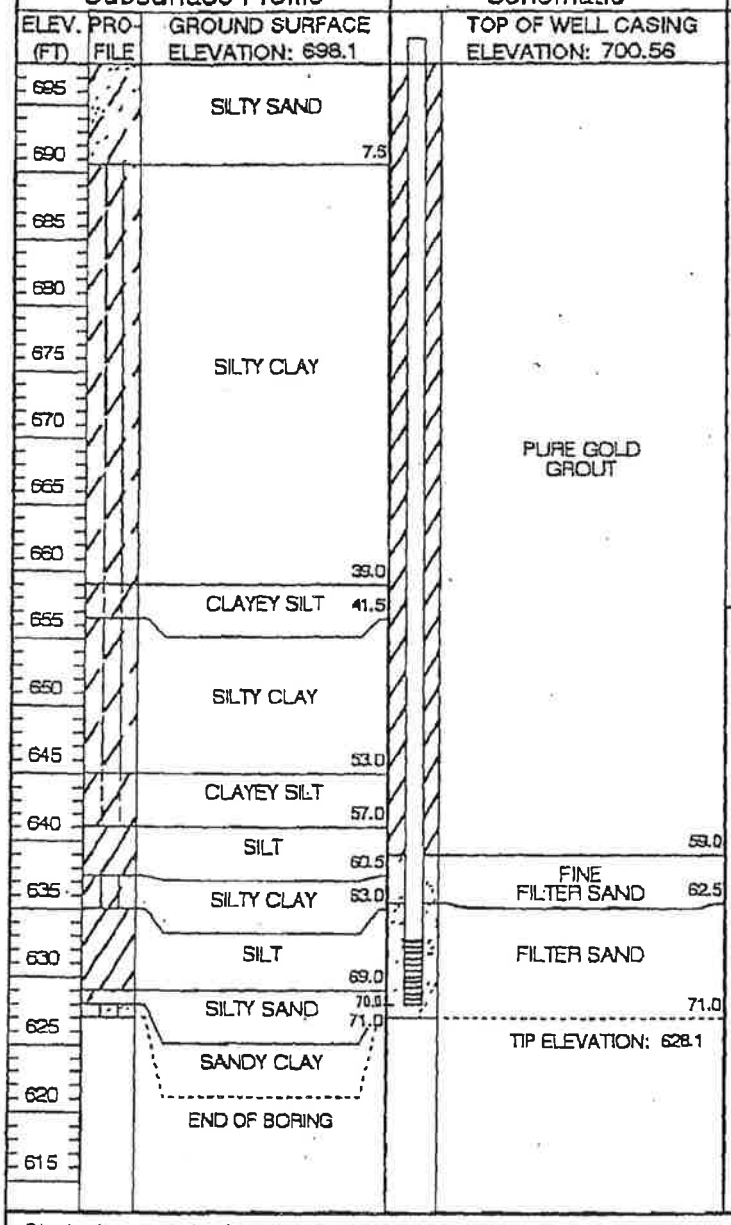
NTH Consultants, Ltd.

MONITORING WELL NO. OB-31AR

Project Name : WAYNE DISPOSAL, INC. - SITE NO. 2 NTH Proj. No: 13-3051 00

Project Location : VAN BUREN TOWNSHIP, WAYNE COUNTY, MICHIGAN Checked By : ACE

LOG OF MONITORING WELL



GROUNDWATER DATA

Date	Ground-water Elev. (ft)	Comments
02/03/93	653.91	BEFORE DEVELOPMENT
02/09/93	656.36	BEFORE DEVELOPMENT
02/25/93	656.19	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-31AR.

[2] TOP OF CASING & GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

[3] WELL INSTALLED TO REPLACE MONITORING WELL NO. OB-31A.

[4] CENTRALIZERS WERE USED TO MAINTAIN THE VERTICALITY OF THE WELL ASSEMBLY IN THE BOREHOLE.

FIELD MEASUREMENTS DURING DRILLING:

pH: 8.53
SPEC. COND: 361 µmhos/cm

FIELD MEASUREMENTS AFTER DEVELOPMENT:

pH: 8.21
SPEC. COND: 309 µmhos/cm

Started:	02/02/93
Completed:	02/03/93
Inspector:	C. ENDLER
Driller:	G. QUALLS
Contractor:	GEO-TEK, INC.
Equipment:	CME-750 ALL-TERRAIN DRILLING RIG
Well Type:	MONITORING

Casing Diameter:	2.0"
Casing Length:	67.5'
Casing Type:	STAINLESS STEEL
Screen Diameter:	2.0"
Screen Length:	5.0'
Screen Mesh:	0.007"
Screen Type:	STAINLESS STEEL

Figure No. A-4

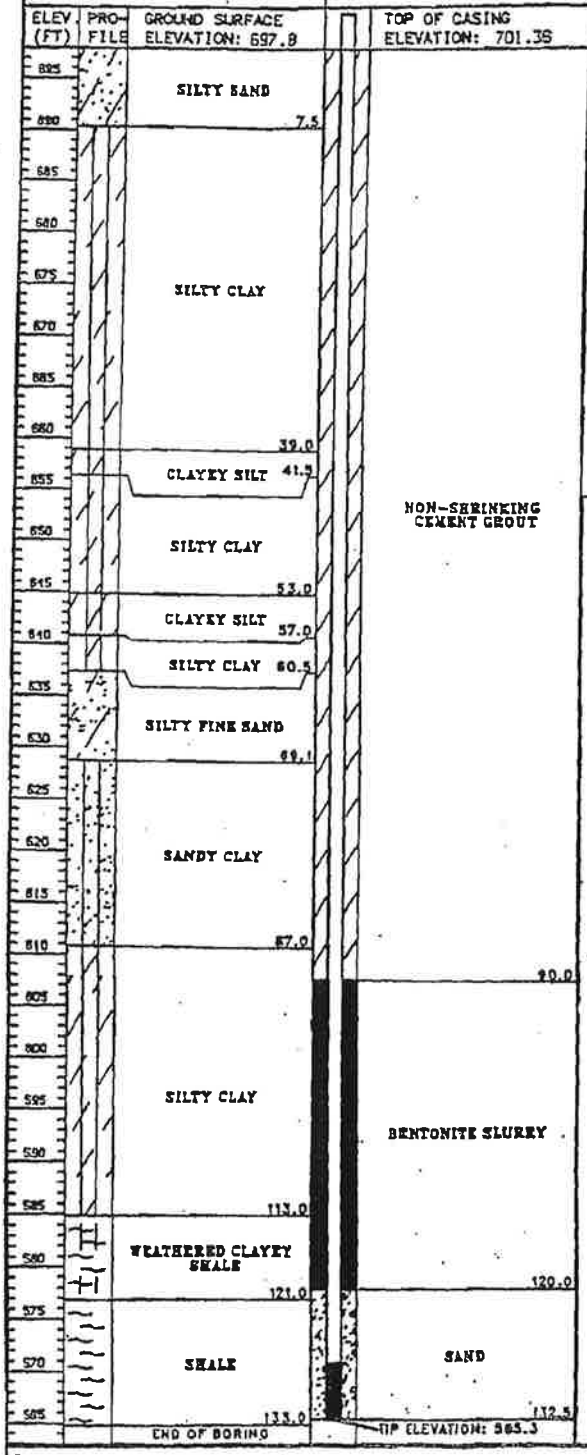
NEYER, TISEO & HINDO, LTD.

MONITOR WELL NO. OB-32

Project Name: WAYNE DISPOSAL LANDFILL – SITE NO. 2 — NTH Pro. No. 94315 OW

Project Location: VAN BUREN TWP., WAYNE COUNTY, MICHIGAN — Chk. By: LLB

LOG OF MONITOR INSTALLATION



GROUNDWATER DATA

Date	Ground-water Elev.(ft)	Comments
7/23/87	655.70	
7/28/87	651.35	
7/29/87	651.25	
7/31/87	651.15	
8/18/87	651.00	
8/21/87	650.72	
8/25/87	650.77	
8/31/87	651.10	
9/4/87	650.78	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-32.

[2] TOP OF CASING AND GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

Started:	7/21/87	Casing Diam.:	2"
Completed:	7/21/87	Casing Length:	127'
Inspector:	R. BURNS / M. TAKACS	Casing Type:	107.5' GALV. / 20' SS
Driller:	S. REMPALSKI	Screen Diam.:	2"
Contractor:	MATECO DRILLING COMPANY	Screen Length:	5'
Equipment:	CME-550	Screen Mesh:	0.007"
Observation Type:	MONITORING WELL	Screen Type:	STAINLESS STEEL

Figure No. 12

MONITORING WELL NO: OB-34A

NTH CONSULTANTS, LTD.

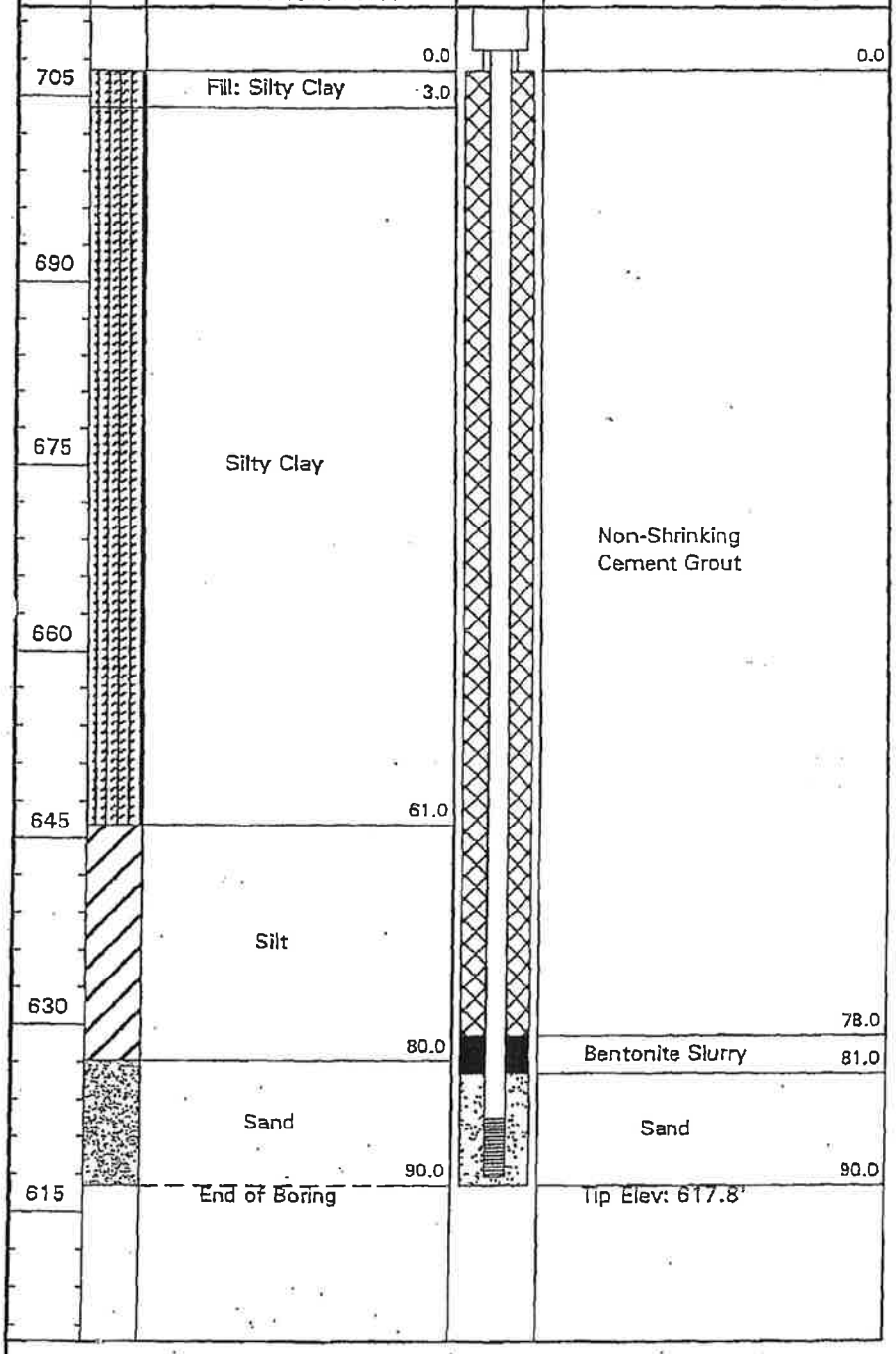
Project Name: *WAYNE DISPOSAL, INC.*

Project Location: *BELLEVILLE, MICHIGAN*

NTH Proj. No: *13-020395-01*

Checked By: RBM

LOG OF MONITORING WELL



GROUNDWATER DATA

DATE	ELEV. (ft.)	COMMENTS
06-24-03	n/a	due to use of drilling fluids

NOTES

[1] For details of subsurface strata, see Log of Test Boring OB-34A.

Started:	*06/23/03*	Casing Diameter:	*2.0 in*
Completed:	*06/24/03*	Casing Length:	*89.25 ft*
Inspector:	*K. Warning*	Casing Type:	*Stainless Steel*
Contractor:	*American Drilling & Testing Co.*	Screen Diameter:	*2.0 in*
Driller:	*R. Rumptz / H. Pace*	Screen Length:	*5.0 ft*
Equipment:	*CME-750 & CME-550*	Screen Mesh:	*0.007 in*
Well Type:	*Monitoring*	Screen Type:	*Stainless Steel*

FIGURE NO.

MONITORING WELL NO: OB-35A

NTH CONSULTANTS, LTD.

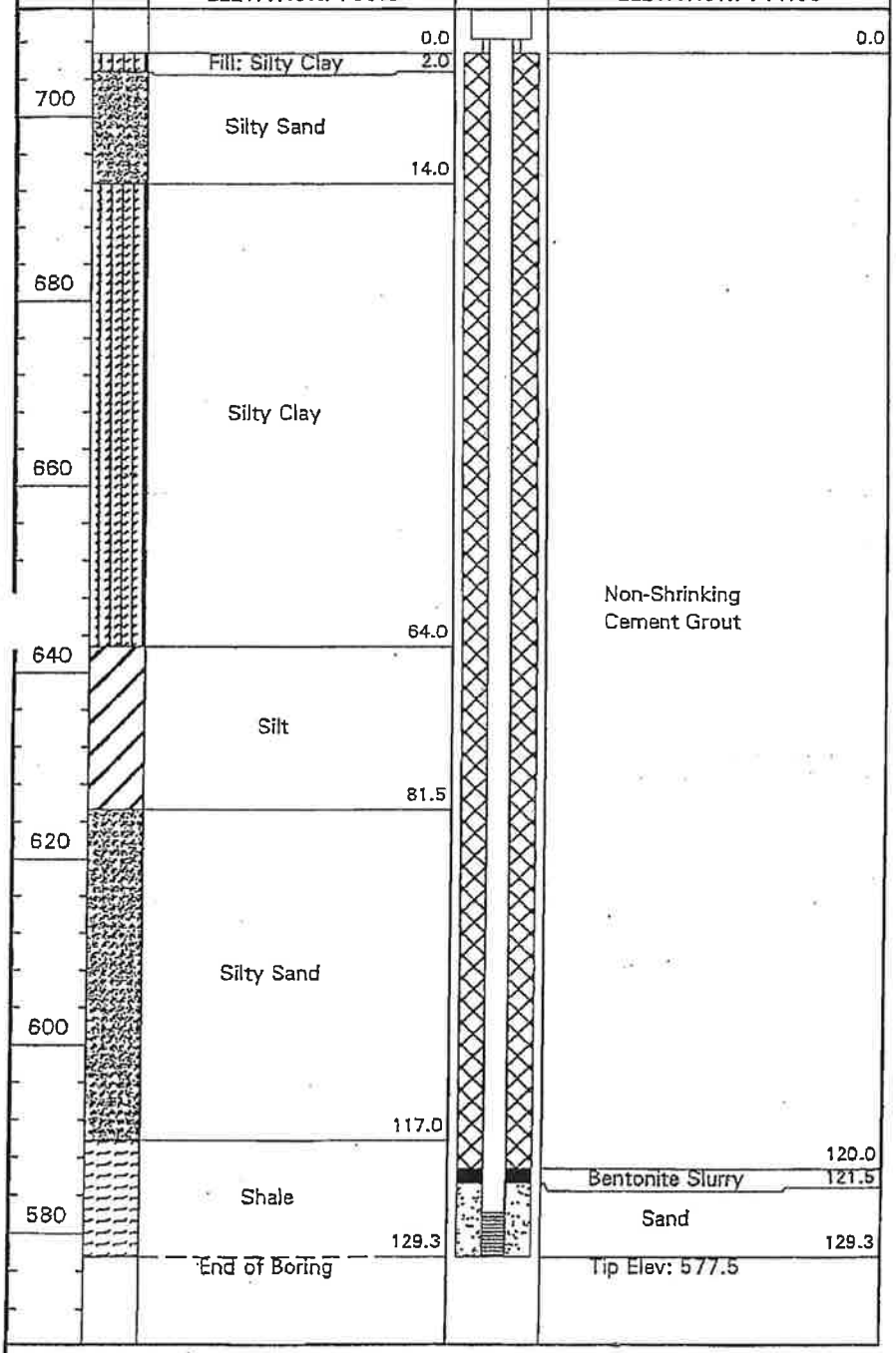
Project Name: *WAYNE DISPOSAL, INC.*

Project Location: *BELLEVILLE, MICHIGAN*

NTH Proj. No: *13-020395-01*

Checked By: RBM

LOG OF MONITORING WELL



GROUNDWATER DATA

DATE	ELEV. (ft.)	COMMENTS
06-24-03	n/a	due to use of drilling fluids

NOTES

[1] For details of subsurface strata, see Log of Test Boring OB-35A.

Started:	*06/19/03*	Casing Diameter:	*2.0 in*
Completed:	*06/20/03*	Casing Length:	*128.89 ft*
Inspector:	*K. Warning*	Casing Type:	*Stainless Steel*
Contractor:	*American Drilling & Testing Co.*	Screen Diameter:	*2.0 in*
Driller:	*R. Rumptz / H. Pace*	Screen Length:	*5.0 ft*
Equipment:	*CME-750 & CME-550*	Screen Mesh:	*0.007 in*
Well Type:	*Monitoring*	Screen Type:	*Stainless Steel*

FIGURE NO.

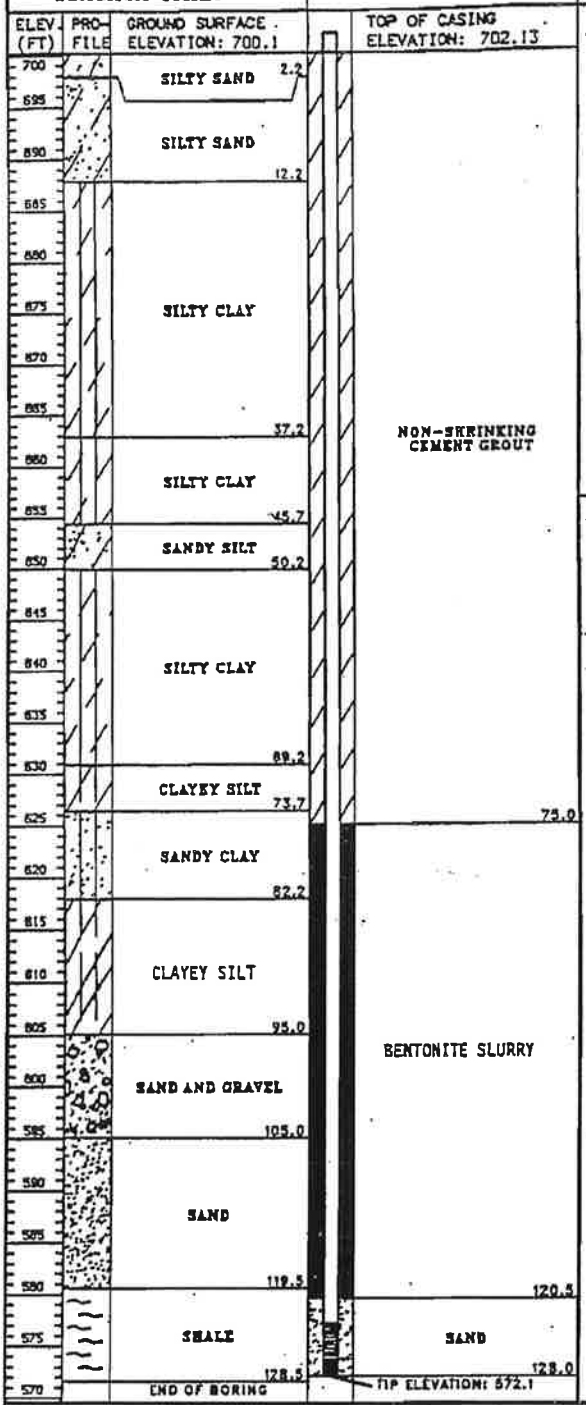
NEYER, TISEO & HINDO, LTD.

MONITOR WELL NO. OB-36

Project Name: WAYNE DISPOSAL LANDFILL – SITE NO. 2
Project Location: VAN BUREN TWP., WAYNE COUNTY, MICHIGAN

NTH Pro. No. 94315 OW
Chk. By: RLB

LOG OF MONITOR INSTALLATION



GROUNDWATER DATA

Date	Groundwater Elev. (ft)	Comments
10/22/87	649.70	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-36
[2] TOP OF CASING AND GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

Started:	10/1/87	Casing Diam.:	2"
Completed:	10/1/87	Casing Length:	125'
Inspector:	M. TAKACS / R. BURNS	Casing Type:	70' GAVL / 55' SS
Driller:	S. REMPALSKI	Screen Diam.:	2"
Contractor:	MATECO DRILLING COMPANY	Screen Length:	5'
Equipment:	CME-550	Screen Mesh:	0.007"
Observation Type:	MONITORING WELL	Screen Type:	STAINLESS STEEL

Figure No. 15

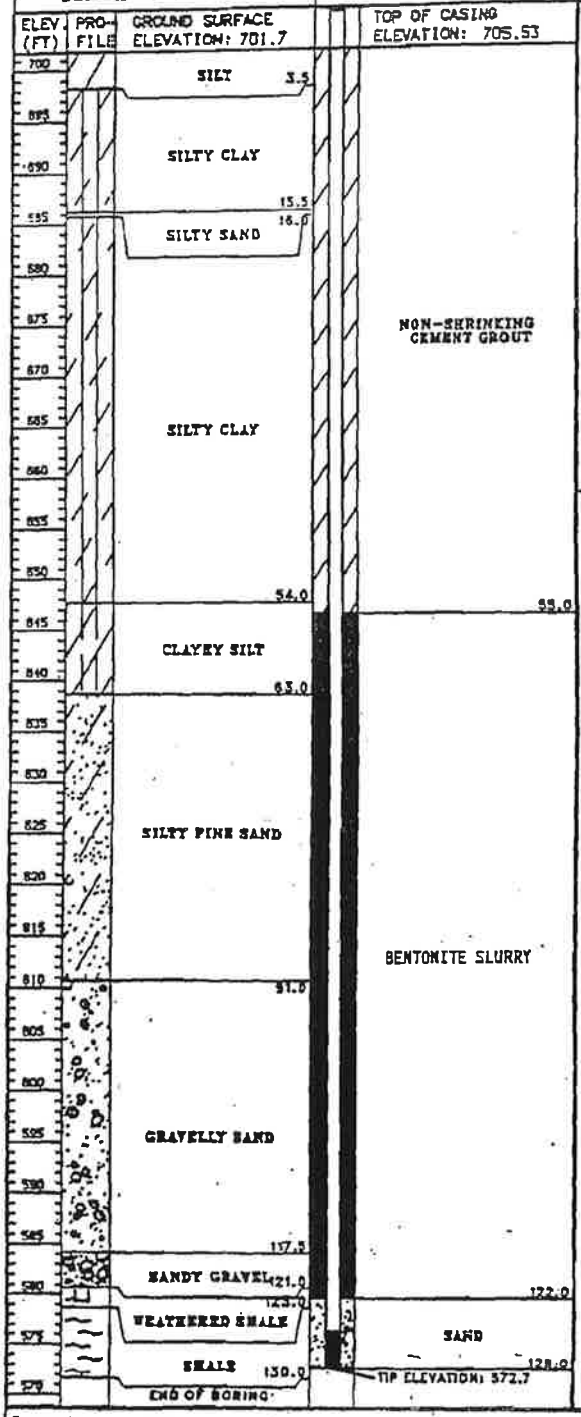
NEYER, TISEO & HINDO, LTD.

MONITOR WELL NO. OB-37

Project Name: WAYNE DISPOSAL LANDFILL - SITE NO. 2
Project Location: VAN BUREN TWP., WAYNE COUNTY, MICHIGAN

NTH Pro. No. 94315 OW
Chk. By: LLB

LOG OF MONITOR INSTALLATION



GROUNDWATER DATA

Date	Ground-water Elev.(ft)	Comments
7/25/87	663.21	
7/28/87	652.10	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-37
[2] TOP OF CASING AND GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

Started: 9/21/87
Completed: 9/24/87
Inspector: R. BURNS
Driller: S. RUMPALSKI
Contractor: MATTCO DRILLING COMPANY
Equipment: CME-550
Observation Type: MONITORING WELL

Casing Diam.: 2"
Casing Length: 128.3'
Casing Type: 34.3' GALV. / 79' SS
Screen Diam.: 2"
Screen Length: 3.5'
Screen Mesh: 0.01"
Screen Type: STAINLESS STEEL

Figure No. 16

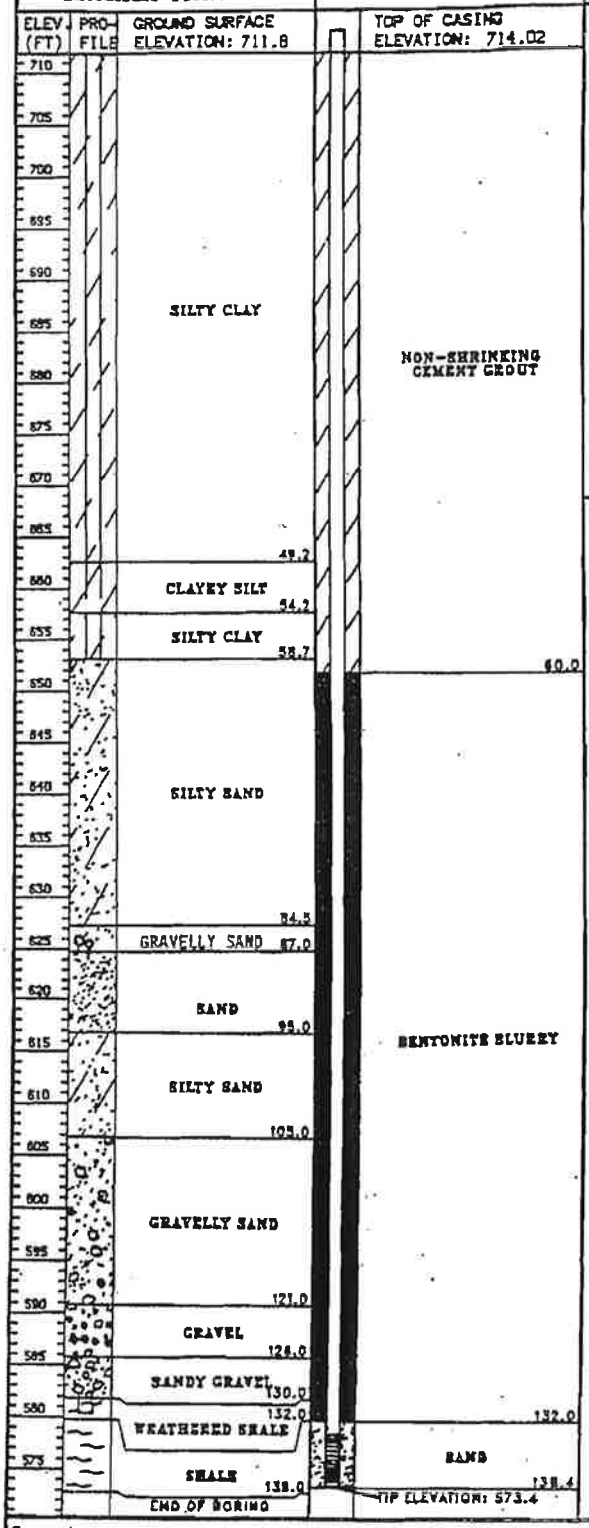
NEYER, TISEO & HINDO, LTD.

MONITOR WELL NO. OB-38

Project Name: WAYNE DISPOSAL LANDFILL - SITE NO. 2
Project Location: VAN BUREN TWP., WAYNE COUNTY, MICHIGAN

NTH Pro. No. 94315 OW
Chk. By: RLB

LOG OF MONITOR INSTALLATION



GROUNDWATER DATA

Date	Ground-water Elev. (ft)	Comments
9/18/87	653.12	
9/23/87	651.13	
9/24/87	651.02	
9/25/87	650.86	
9/28/87	650.70	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-38
[2] TOP OF CASING AND GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

Started:	9/9/87
Completed:	9/10/87
Inspector:	R. BURNS / M. TAKACS
Driller:	S. REMPALSKI
Contractor:	MATECO DRILLING COMPANY
Equipment:	CME-550
Observation Type:	MONITORING WELL

Casing Diam.:	2"
Casing Length:	137.1'
Casing Type:	30.1' GALV. / 87' SS
Screen Diam.:	2"
Screen Length:	3.5'
Screen Mesh:	0.01"
Screen Type:	STAINLESS STEEL

Figure No. 17

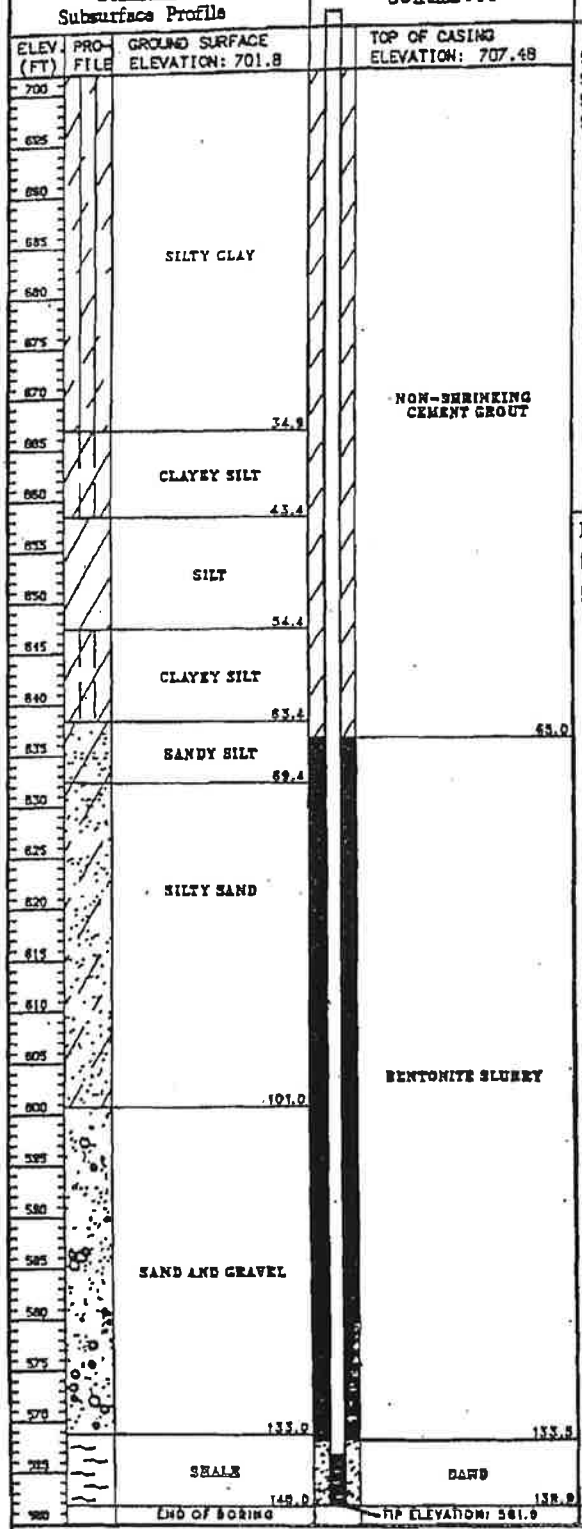
NEYER, TISEO & HINDO, LTD.

MONITOR WELL NO. OB-39

Project Name: WAYNE DISPOSAL LANDFILL – SITE NO. 2 NTH Pro. No. 9431S OW

Project Location: VAN BUREN TWP., WAYNE COUNTY, MICHIGAN Chk. By: RLB

LOG OF MONITOR INSTALLATION



GROUNDWATER DATA

Date	Ground-water Elev. (ft)	Comments
9/1/87	652.28	
9/4/87	651.50	
9/9/87	650.88	
9/22/87	650.50	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-39

[2] TOP OF CASING AND GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

Started:	8/31/87
Completed:	9/1/87
Inspector:	R. BURNS
Driller:	S. REMPALSKI
Contractor:	MATECO DRILLING COMPANY
Equipment:	CME-550
Observation Type:	MONITORING WELL

Casing Diam.:	2"
Casing Length:	140.4'
Casing Type:	65.4' GALV. / 75' SS
Screen Diam.:	2"
Screen Length:	5'
Screen Mesh:	0.007"
Screen Type:	STAINLESS STEEL

Figure No. 18

NTH Consultants, Ltd.

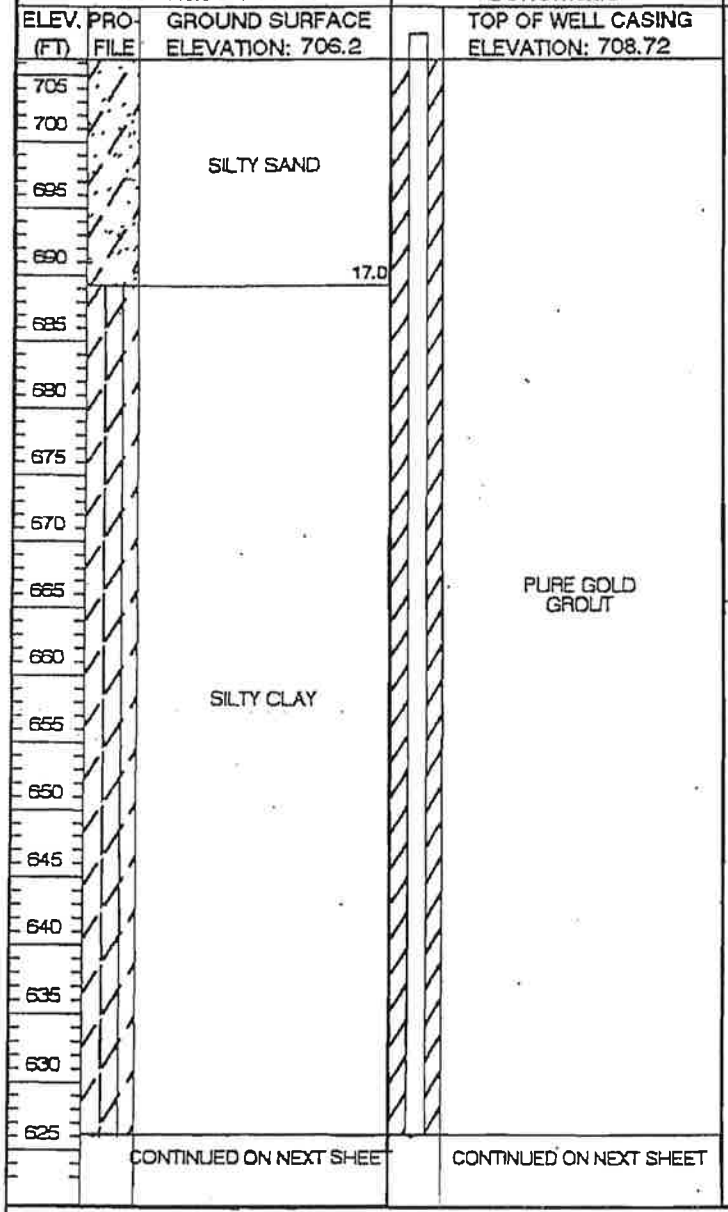
MONITORING WELL NO. OB-40R

Project Name : WAYNE DISPOSAL, INC. - SITE NO. 2 NTH Proj. No: 13-3051 00

Project Location : VAN BUREN TOWNSHIP, WAYNE COUNTY, MICHIGAN Checked By : ACE

LOG OF MONITORING WELL

Generalized Subsurface Profile / Installation Schematic



GROUNDWATER DATA

Date	Ground-water Elev. (ft)	Comments
02/01/93	659.72	BEFORE DEVELOPMENT
02/09/93	658.14	BEFORE DEVELOPMENT
02/25/93	656.69	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-40R.

[2] TOP OF CASING & GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

[3] WELL INSTALLED TO REPLACE MONITORING WELL NO. OB-40.

[4] CENTRALIZERS WERE USED TO MAINTAIN THE VERTICALITY OF THE WELL ASSEMBLY IN THE BOREHOLE.

FIELD MEASUREMENTS DURING DRILLING:

pH: 8.10
SPEC. COND: 310 µmhos/cm

FIELD MEASUREMENTS AFTER DEVELOPMENT:

pH: 8.03
SPEC. COND: 302 µmhos/cm

Started: 01/29/93
Completed: 02/01/93
Inspector: C. ENDLER
Driller: G. QUALLS
Contractor: GEO-TEK, INC.
Equipment: CME-750 ALL-TERRAIN DRILLING RIG
Well Type: MONITORING

Casing Diameter: 2.0"
Casing Length: 93.5'
Casing Type: STAINLESS STEEL
Screen Diameter: 2.0"
Screen Length: 5.0'
Screen Mesh: 0.007"
Screen Type: STAINLESS STEEL

Figure No. A-6a

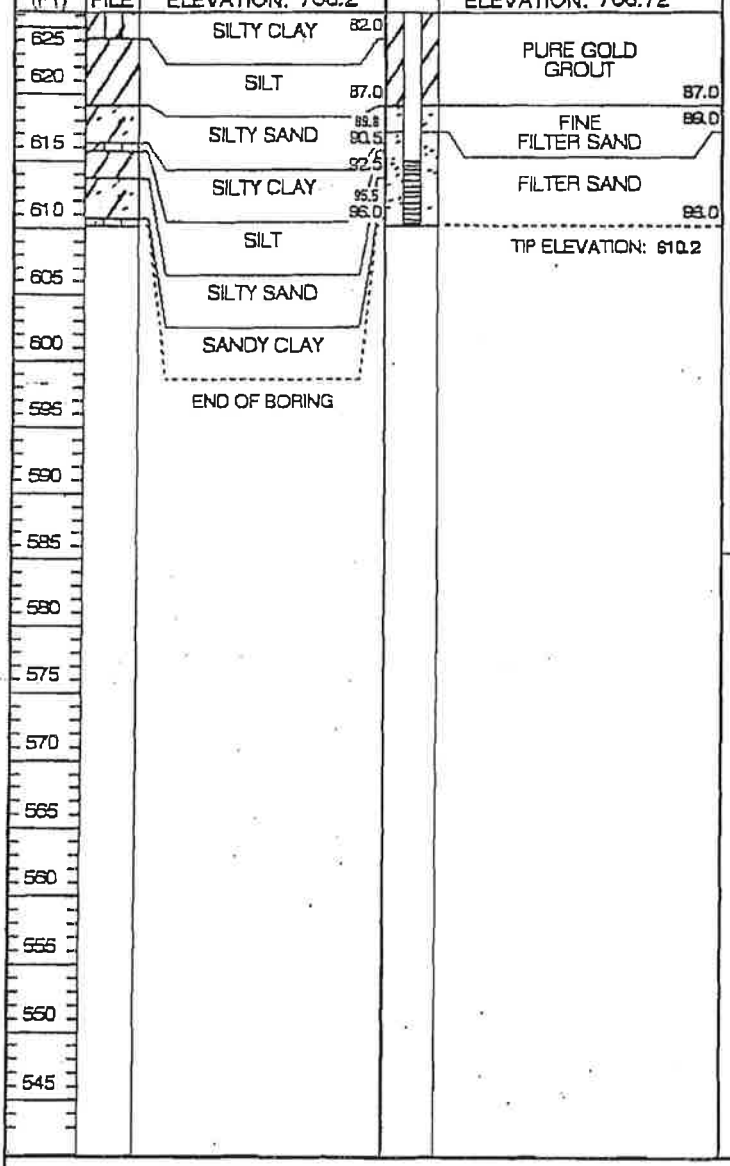
NTH Consultants, Ltd.

MONITORING WELL NO. OB-40R

Project Name : WAYNE DISPOSAL, INC. - SITE NO. 2 — NTH Proj. No: 13-3051 00

Project Location : VAN BUREN TOWNSHIP, WAYNE COUNTY, MICHIGAN — Checked By : ACE

LOG OF MONITORING WELL



GROUNDWATER DATA

Date	Groundwater Elev. (ft)	Comments
02/01/93	659.72	BEFORE DEVELOPMENT
02/09/93	658.14	BEFORE DEVELOPMENT
02/25/93	656.69	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATA, SEE LOG OF TEST BORING NO. OB-40R.

[2] TOP OF CASING & GROUND SURFACE ELEVATIONS PROVIDED BY WAYNE DISPOSAL, INC.

[3] WELL INSTALLED TO REPLACE MONITORING WELL NO. OB-40.

[4] CENTRALIZERS WERE USED TO MAINTAIN THE VERTICALITY OF THE WELL ASSEMBLY IN THE BOREHOLE.

FIELD MEASUREMENTS DURING DRILLING:

pH: 8.10
SPEC. COND: 310 µmhos/cm

FIELD MEASUREMENTS AFTER DEVELOPMENT:

pH: 8.03
SPEC. COND: 302 µmhos/cm

Started: 01/29/93
Completed: 02/01/93
Inspector: C. ENDLER
Driller: G. QUALLS
Contractor: GEO-TEK, INC.
Equipment: CME-750 ALL-TERRAIN DRILLING RIG
Well Type: MONITORING

Casing Diameter: 2.0"
Casing Length: 93.5'
Casing Type: STAINLESS STEEL
Screen Diameter: 2.0"
Screen Length: 5.0'
Screen Mesh: 0.007"
Screen Type: STAINLESS STEEL

Figure No. A-6b

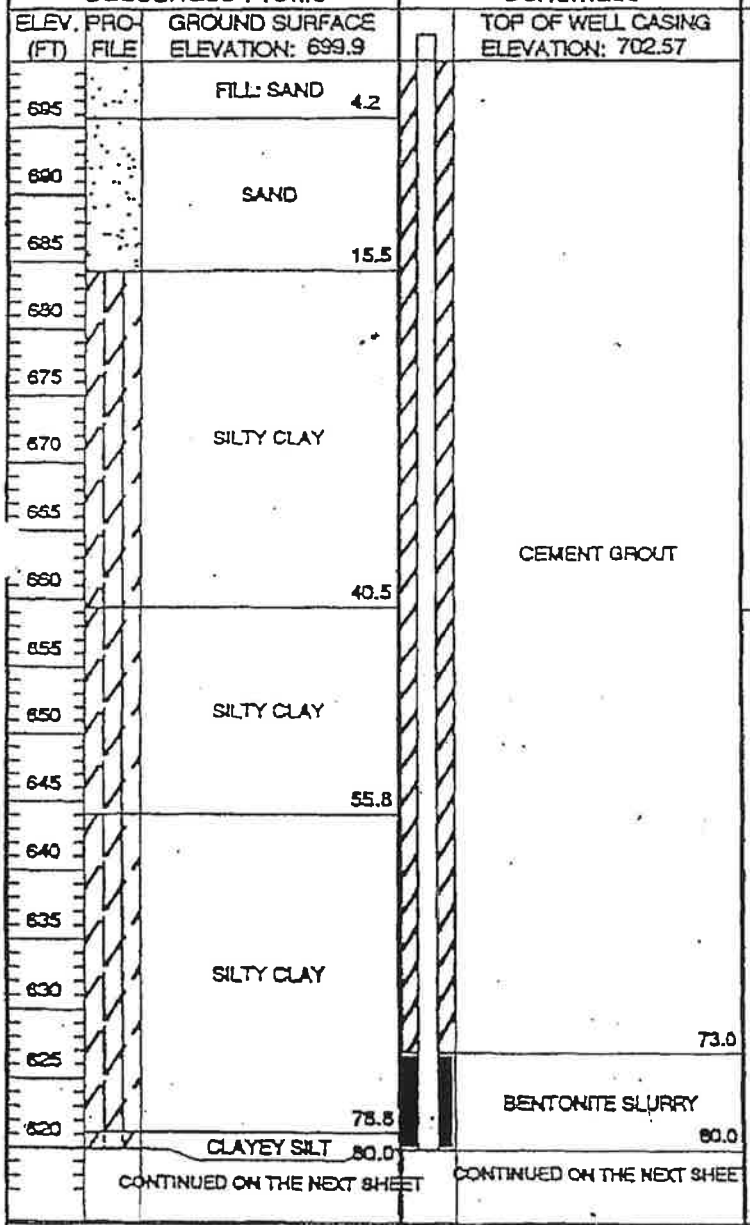
NTH Consultants, Ltd.

MONITORING WELL NO. OB-47

Project Name : MICHIGAN DISPOSAL, INCORPORATED — NTH Proj. No: 90323 OW

Project Location : VAN BUREN TWP, WAYNE COUNTY, MICHIGAN — Check By :

LOG OF MONITORING WELL



GROUNDWATER DATA

Date	Ground-water Elev.(ft)	Comments
07/12/90	652.96	
07/16/90	652.95	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATIGRAPHY, SEE LOG OF TEST BORING OB-47.

[2] WELL DEVELOPED WITH COMPRESSED AIR ON 07/16/90.

[3] TOP OF CASING AND GROUND SURFACE ELEVATIONS DETERMINED BY WDI PERSONNEL.

[4] DEPTH TO FIRST COUPLING IS 0.3 FEET BELOW GROUND SURFACE; SECOND COUPLING IS 10.3 FEET BELOW GROUND SURFACE.

Started: 07/02/90
Completed: 07/12/90
Inspector: G. CROCKFORD
Driller: M. PUFFPAFF
Contractor: ENVIRONMENTAL DRILLING & SERVICES, INC.
Equipment: FAILING F-7
Well Type: MONITORING WELL

Casing Diameter: 2" I.D.
Casing Length: 103 FT
Casing Type: 60' STAINLESS/43' GALVANIZED
Screen Diameter: 2"
Screen Length: 5'
Screen Mesh: .007
Screen Type: STAINLESS STEEL

Figure No. 2

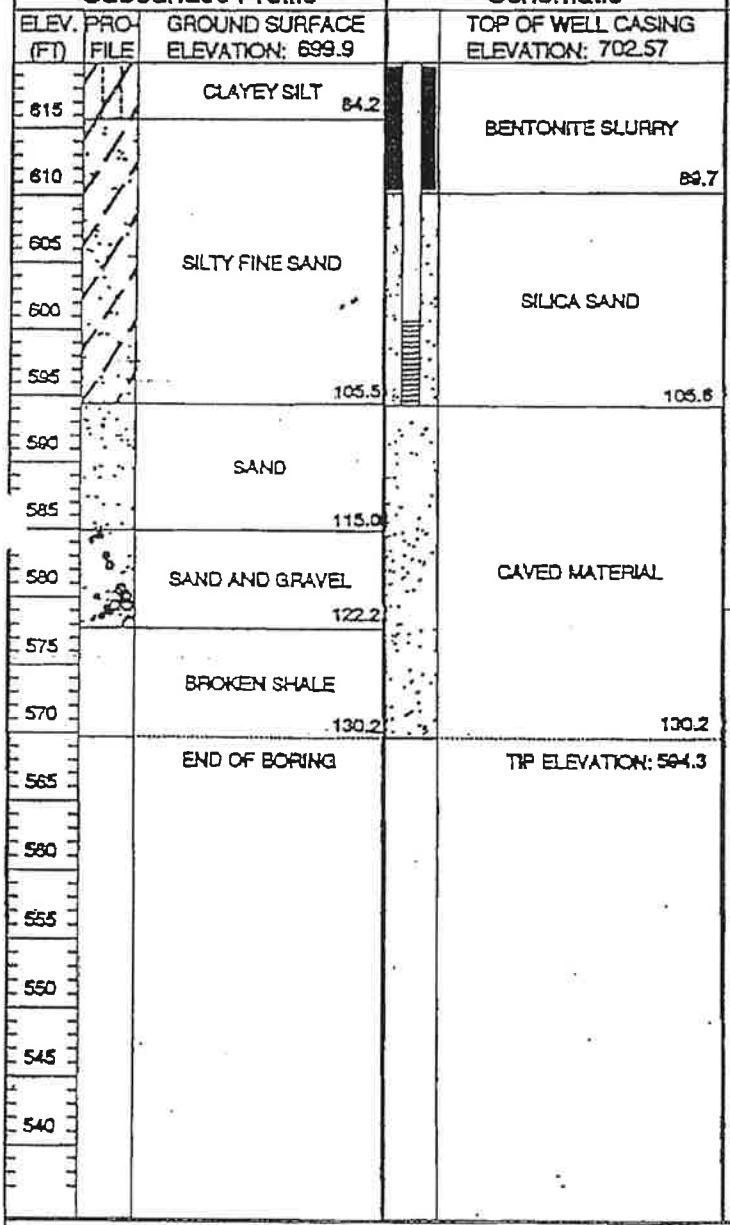
NTH Consultants, Ltd.

MONITORING WELL NO. OB-47

Project Name : MICHIGAN DISPOSAL, INCORPORATED — NTH Proj. No: 90323 OW

Project Location : VAN BUREN TWP, WAYNE COUNTY, MICHIGAN — Check By :

LOG OF MONITORING WELL



GROUNDWATER DATA

Date	Ground-water Elev.(ft)	Comments
07/12/90	652.96	
07/16/90	652.95	

NOTES :

[1] FOR DETAILS OF SUBSURFACE STRATIGRAPHY, SEE LOG OF TEST BORING OB-47.

[2] WELL DEVELOPED WITH COMPRESSED AIR ON 07/16/90.

[3] TOP OF CASING AND GROUND SURFACE ELEVATIONS DETERMINED BY WDI PERSONNEL.

[4] DEPTH TO FIRST COUPLING IS 0.3 FEET BELOW GROUND SURFACE; SECOND COUPLING IS 10.3 FEET BELOW GROUND SURFACE.

Started: 07/02/90
Completed: 07/12/90
Inspector: G. CROCKFORD
Driller: M. PUFFPAFF
Contractor: ENVIRONMENTAL DRILLING & SERVICES, INC.
Equipment: FAILING F-7
Well Type: MONITORING WELL

Casing Diameter: 2" I.D.
Casing Length: 103 FT
Casing Type: 60' STAINLESS/43' GALVANIZED
Screen Diameter: 2"
Screen Length: 5'
Screen Mesh: .007"
Screen Type: STAINLESS STEEL

Figure No. 2

OBSERVATION WELL NO: WW OB-48

NTH CONSULTANTS, LTD.

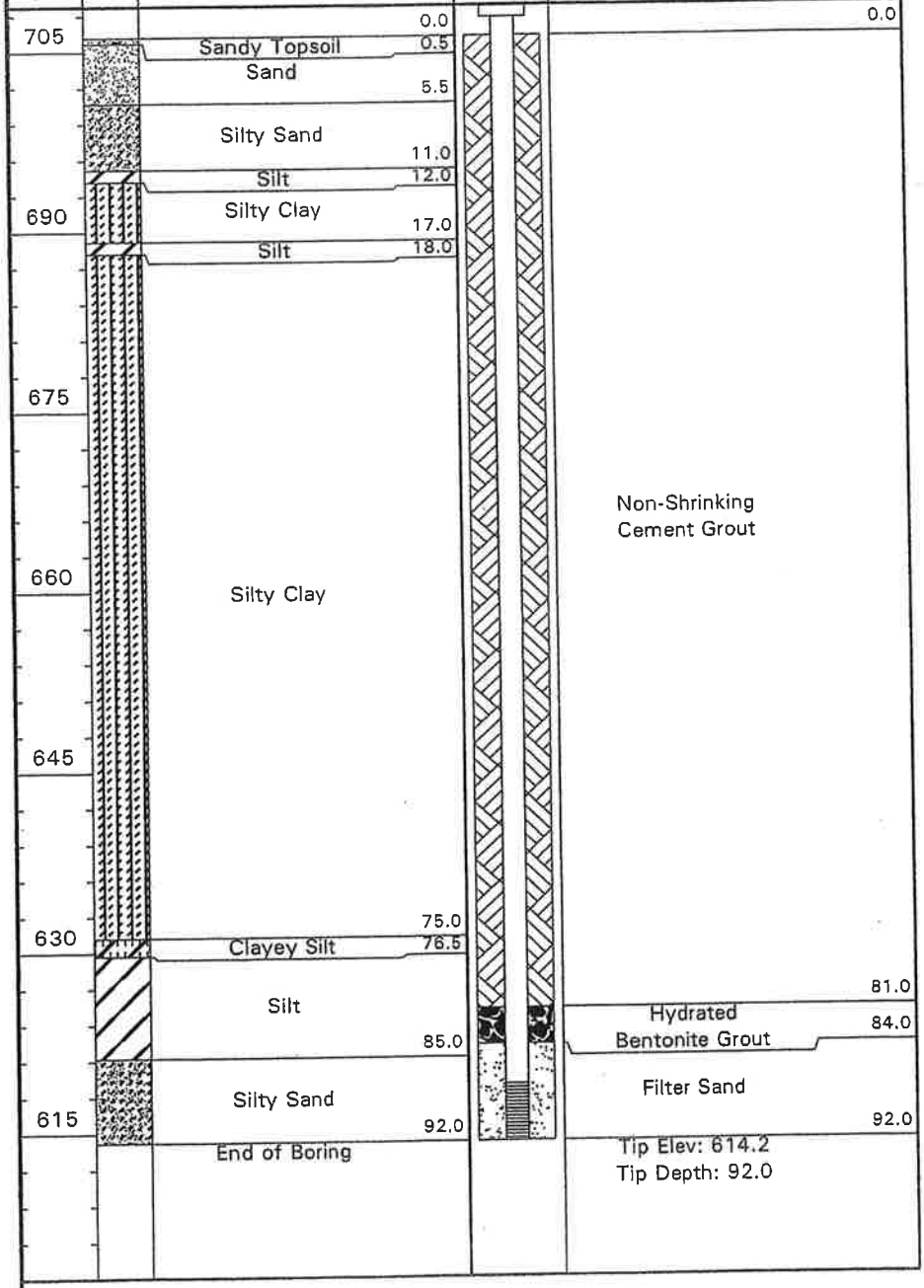
Project Name: *WAYNE DISPOSAL, INC. - WOOD LOT*

Project Location: *BELLEVILLE, MICHIGAN*

NTH Proj. No: *62-080376-01*

Checked By: dlp

LOG OF OBSERVATION WELL



GROUNDWATER DATA

DATE	ELEV. (ft.)	COMMENTS
12-07-08	655.21	
02-09-09	655.10	

NOTES

[1] For details of subsurface strata, see Log of Test Boring TB-W-1.

[2] Location Coordinates: E 3690.00
N 7660.02

Started:	*07-16-08*
Completed:	*07-16-08*
Inspector:	*M. McNamara*
Contractor:	*Mateco Drilling Co.*
Driller:	*J. Pitsch*
Equipment:	*CME-750 ATV Drill Rig*
Well Type:	*Observation*

Casing Diameter:	*2.0 in*
Casing Length:	*89.5 ft*
Casing Type:	*PVC*
Screen Diameter:	*2.0 in*
Screen Length:	*5.0 ft*
Screen Mesh:	*0.010 in*
Screen Type:	*PVC*

FIGURE NO. B-15

MONITORING WELL: MW-OB-49

Project Name: WDI Groundwater Wells
Project Location: Belleville, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 13-060921-20
Checked By: CRK

LOG OF MONITORING WELL

SUBSURFACE PROFILE					INSTALLATION SCHEMATIC		GAS DATA		
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 705.5	DEPTH	DEPTH (FT)	Well Detail	TOP OF WELL CASING ELEVATION: 708.0 ft	DATE	ELEV (FT)	Gas Reading
				0.0			0.0			
700			PROFILE DRILLED		10					
690					20					
680					30					
670					40					
660					50					
650					60		pH Neutral Bentonite Grout			
640					70					
630					80					
620		615.5		90.0	90					
610		608.5	Hard Gray SILTY CLAY with Trace Sand and Gravel	97.0	100					
600		601.5	Very Compact Fine to Coarse SAND and GRAVEL	104.0						
		597.5	Very Compact Fine to Medium SAND and GRAVEL	108.0	110					
590		592.5	Very Compact Fine to Medium SAND and GRAVEL	113.0						
		587.5	Compact Fine to Coarse SAND and GRAVEL	118.0	120		122.0			
580			Very Stiff to Hard Gray SILTY CLAY				Bentonite Pellets 125.0			
		576.5		129.0	130					
570		572.5	Hard Gray SILTY CLAY with Dry Sand and Gravel	133.0			Sand 133.0			
			SHALE							
560			END OF BORING AT 133.0 FEET.							

Total Depth: *133.0 FT*
Installation Date: *5/7/2014*
Inspector: *M. McNamara*
Contractor: *Mateco*
Driller: *Gary Swift*
Equipment: *CME-55 track mounted ATV rig with 4-1/4" I.D. HSA to EOB.*

Notes:

Casing Diameter: *2"*
Casing Length: *130'*
Casing Type: *Stainless Steel*
Tip Elevation: *572.5*
GPS Coordinates:

Screen Diameter: *2"*
Screen Length: *5'*
Screen Mesh: *0.010"*
Screen Type: *Stainless Steel*

Well Type: *MONITORING WELL*

Figure No. 6

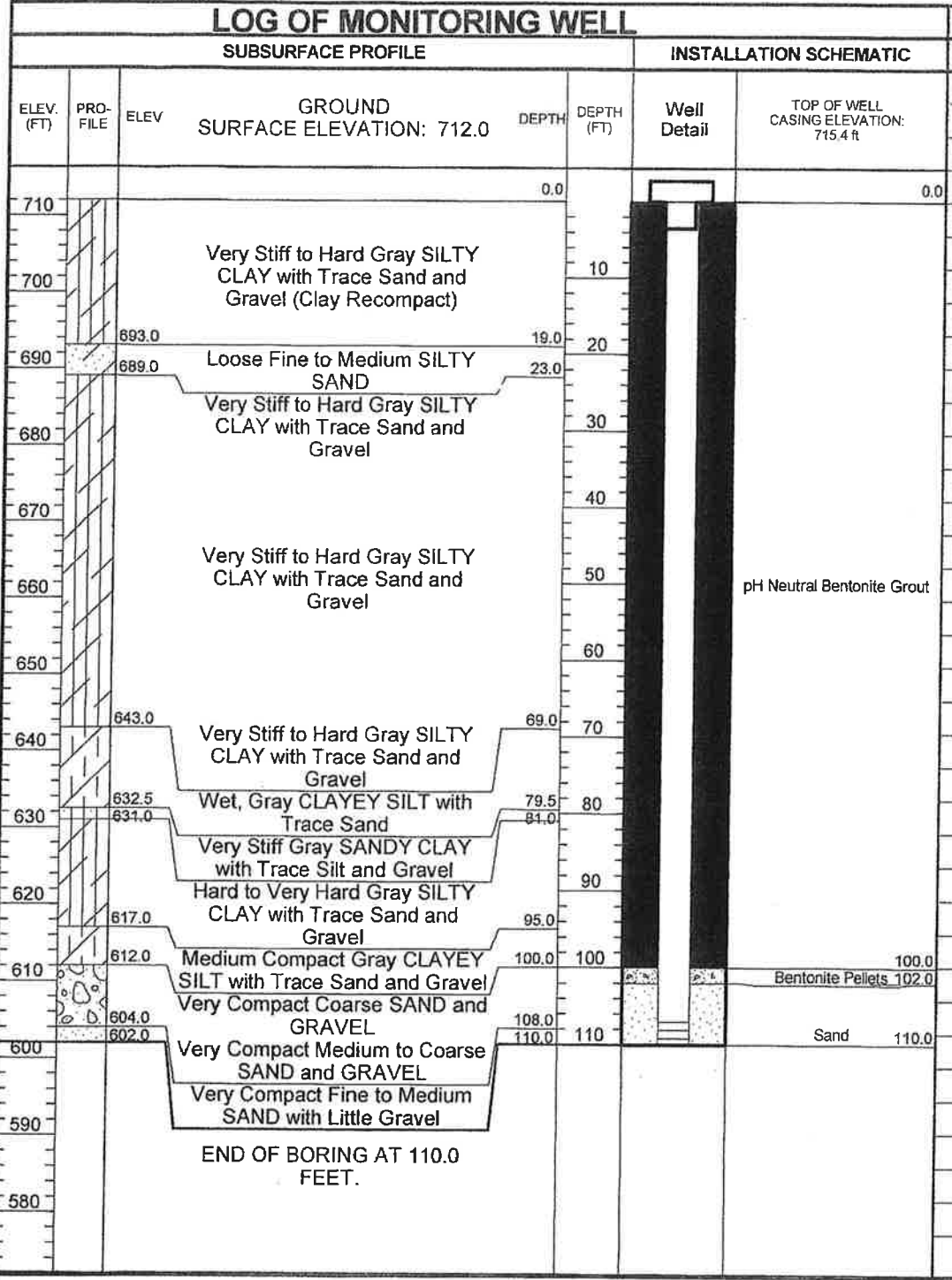
MONITORING WELL LOG MW 13-060921-20.GPJ NTH CORPORATE.GDT 8/6/14

MONITORING WELL: MW-OB-50

Project Name: WDI Groundwater Wells
Project Location: Belleville, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 13-060921-20
Checked By: CRK

LOG OF MONITORING WELL



GAS DATA		
DATE	ELEV (FT)	Gas Reading

Total Depth: *110.0 FT*
Installation Date: *4/29/2014*
Inspector: *M. McNamara*
Contractor: *Mateco*
Driller: *Gary Swift*
Equipment: *CME-55 track mounted ATV rig with 4-1/4" I.D. HSA to EOB.*

Notes:

Casing Diameter: *2"*
Casing Length: *108.43'*
Casing Type: *PVC*
Tip Elevation: *602.43*
GPS Coordinates:

Screen Diameter: *2"*
Screen Length: *5'*
Screen Mesh: *0.007"*
Screen Type: *PVC*

Well Type: *MONITORING WELL*

Figure No. 7

MONITORING WELL LOG MW 13-060921-20.GPJ NTH CORPORATE.GDT 8/6/14

MONITORING WELL: MW-OB-51

Project Name: WDI Groundwater Wells
Project Location: Belleville, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 13-060921-20
Checked By: CRK

LOG OF MONITORING WELL

SUBSURFACE PROFILE						INSTALLATION SCHEMATIC		GAS DATA		
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 715.5	DEPTH	DEPTH (FT)	Well Detail	TOP OF WELL CASING ELEVATION: 719.2 ft	DATE	ELEV (FT)	Gas Reading
				0.0			0.0			
710		711.0	Stiff Gray SILTY CLAY Cap Material	4.5	10					
		702.5	Dry Gray CLAYEY SILT with Trace Sand and Gravel and Trace Debris	13.0						
700			Very Stiff Gray SILTY CLAY with Trace Sand and Gravel		20					
690					30					
680			Very Stiff Gray SILTY CLAY with Trace Sand and Gravel							
		675.5		40.0	40					
670		671.5	Stiff Gray SILTY CLAY with Occasional Wet Silt Lenses	44.0						
			Very Stiff to Hard Gray SILTY CLAY with Trace Sand and Gravel		50		pH Neutral Bentonite Grout			
660		661.0		54.5						
		658.5	Dry SILT with Trace Clay	57.0	60					
650			Hard Gray SILTY CLAY with Numerous Dry Silt Seams							
		646.5		69.0	70					
640			Hard Gray SILTY CLAY with Numerous Dry Silt Seams							
			Wet Gray CLAYEY SILT		80					
630		631.5		84.0						
			Very Hard Gray SILTY CLAY with Trace Sand and Gravel		90					
620		616.5		99.0	100					
		612.5	Wet Gray SILT with Trace Sand	103.0			101.0 Bentonite Pellets 103.0			
610		605.5	Very Compact Medium to Coarse SAND and GRAVEL with Trace Silt	110.0	110		Sand 110.0			
600			Very Compact Medium to Coarse SAND and GRAVEL with Trace Silt							
590			END OF BORING AT 110.0 FEET.							
580										

Total Depth: *110.0 FT*
Installation Date: *4/24/2014*
Inspector: *M. McNamara*
Contractor: *Mateco*
Driller: *Gary Swift*
Equipment: *CME-55 track mounted ATV rig with 4-1/4" I.D. HSA to EOB.*

Notes:

Casing Diameter: *2"*
Casing Length: *108.69'*
Casing Type: *PVC*
Tip Elevation: *606.19*
GPS Coordinates:

Screen Diameter: *2"*
Screen Length: *5'*
Screen Mesh: *0.007"*
Screen Type: *PVC*

Well Type: *MONITORING WELL*

Figure No. 8

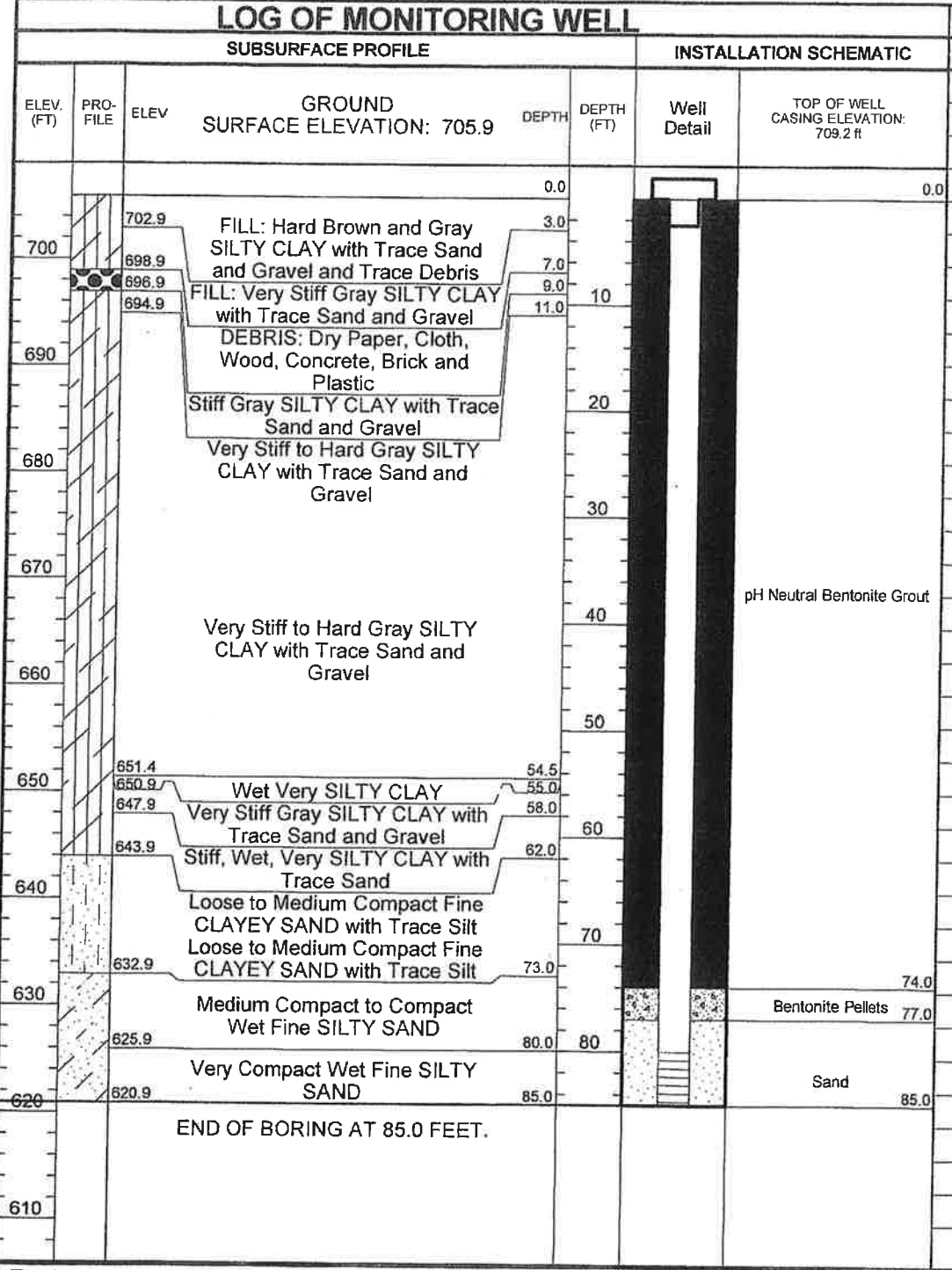
MONITORING WELL LOG MW 13-060921-20.GPJ NTH.CORPORATE.GDT 8/6/14

MONITORING WELL: MW-OB-52

Project Name: WDI Groundwater Wells
Project Location: Belleville, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 13-060921-20
Checked By: CRK

LOG OF MONITORING WELL



GAS DATA		
DATE	ELEV (FT)	Gas Reading

Total Depth: *85.0 FT*
Installation Date: *5/1/2014*
Inspector: *M. McNamara*
Contractor: *Mateco*
Driller: *Gary Swift*
Equipment: *CME-55 track mounted ATV rig with 4-1/4" I.D. HSA to EOB.*

Notes:

Casing Diameter: *2"*
Casing Length: *83.34'*
Casing Type: *PVC*
Tip Elevation: *620.9*
GPS Coordinates:

Screen Diameter: *2"*
Screen Length: *5'*
Screen Mesh: *0.007"*
Screen Type: *PVC*

Well Type: *MONITORING WELL*

Figure No. 9

MONITORING WELL LOG MW 13-060921-20.GPJ NTH_CORPORATE.GDT 8/8/14

OBSERVATION WELL NO: WW-1088 OB-53

NTH CONSULTANTS, LTD.

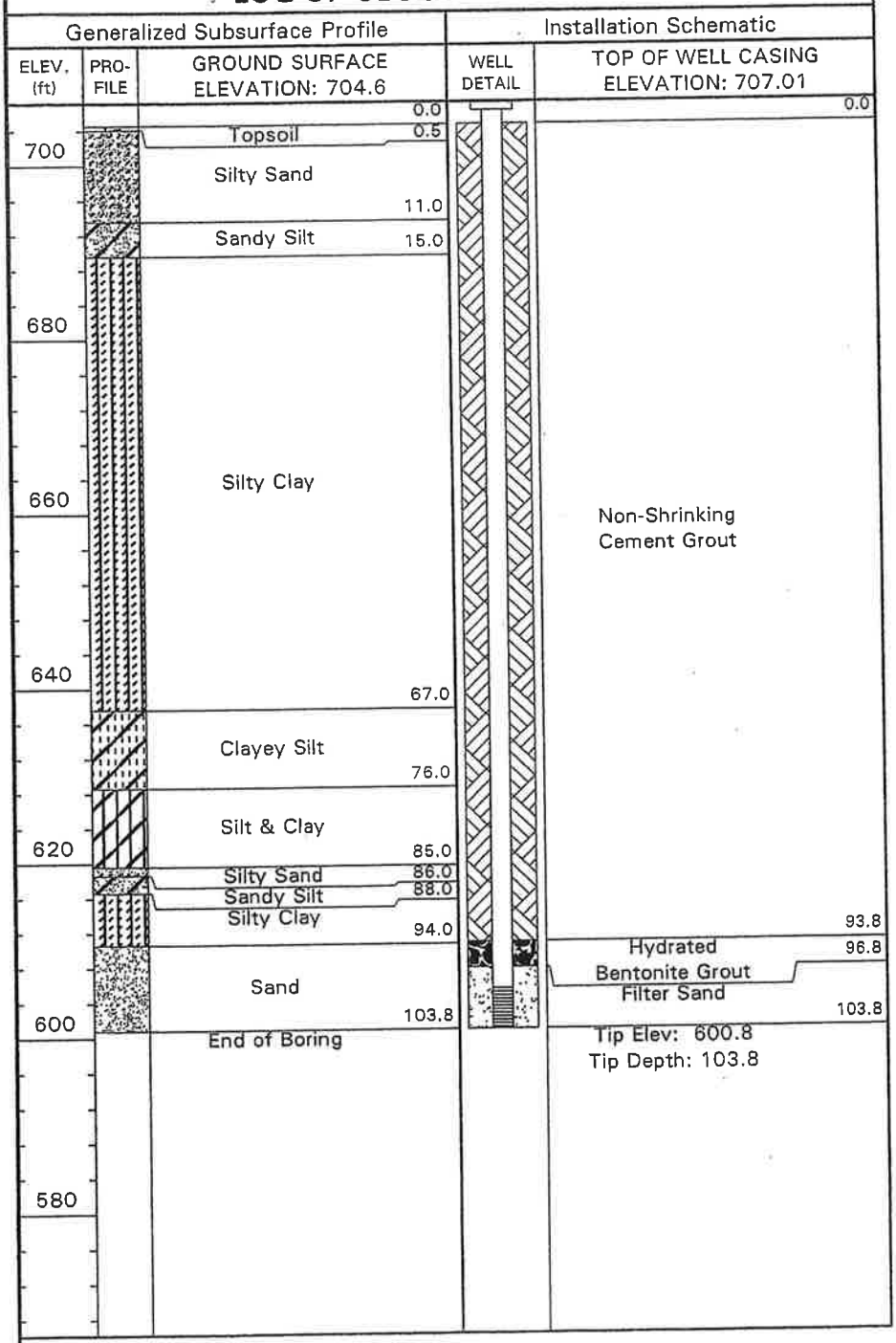
Project Name: *WAYNE DISPOSAL, INC. - WOOD LOT*

Project Location: *BELLEVILLE, MICHIGAN*

NTH Proj. No: *62-080376-01*

Checked By: dlp

LOG OF OBSERVATION WELL



GROUNDWATER DATA

DATE	ELEV. (ft.)	COMMENTS
12-07-08	652.79	
02-09-09	652.77	

NOTES

[1] Generalized subsurface profile based on adjacent test boring TB-W-10.

[2] Location Coordinates: E 3704.07
N 7052.42

Started:	*07-12-08*
Completed:	*07-12-08*
Inspector:	*M. McNamara*
Contractor:	*Mateco Drilling Co.*
Driller:	*J. Pitsch*
Equipment:	*CME-750 ATV Drill Rig*
Well Type:	*Observation*

Casing Diameter:	*2.0 in*
Casing Length:	*101.2 ft*
Casing Type:	*PVC*
Screen Diameter:	*2.0 in*
Screen Length:	*5.0 ft*
Screen Mesh:	*0.010 in*
Screen Type:	*PVC*

FIGURE NO. B-18

RECORD OF BOREHOLE: MW-OB-51A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

START DATE: March 25, 2019
END DATE: March 26, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 717.8 ft
COORDINATES: N: 6970.1 ft E: 4333.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DRILL RIG: LS 250 Mini-Sonic
DRILL METHOD: Roto-Sonic (4-inch rods to 100', 6-inch rods to 20')

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	NUMBER	TYPE	REC %	BLOWS	N-VALUE
0	SILTY CLAY with organics.	CL	0.0					
1	SANDY CLAY, some gravel, some fine to medium sand, brown, moist.	CL	717.3 0.5					
2			714.8					
3	SILTY CLAY, some gravel, some fine to course sand, gray, moist.		3.0	1	SC	100		
4								
5								
6								
7								
8								
9			708.8					
10	SILTY CLAY with fine to coarse sand, some organics, trace gravel, gray to dark gray, moist.		9.0 707.8					
11	SILTY CLAY, some gravel, some fine to coarse sand, gray, moist. Debris (concrete, wood, brick, plastic), dry, from 13.5 to 14.5 feet bgs.		10.0					
12								
13								
14			703.3					
15	SILTY CLAY, trace gravel, trace fine to coarse sand, gray, moist. Silt partings at 61.1 and 63 feet bgs.	CL-ML	14.5	2	SC	100		
16								
17								
18								
19								
20								
21								
22								
23								
24								
25				3	SC	100		
26								
27								
28								
29								
30								
31								
32								
33								
34								
35				4	SC	100		
36								
37								
38								
39								
40	Continued on Next Page							

SAMPLES: Hammer ASTM D1586 Blows per 6 in 140-lb hammer 30 in drop

WATER CONTENT PERCENT: Plastic & Liquid Limits (%); Water Content (%); NP Nonplastic

SHEAR STRENGTH: Nat Vane; Rem Vane; Pocket Pen

ADDITIONAL LAB TESTING

ADDITIONAL OBSERVATIONS

GROUNDWATER OBSERVATIONS

CONSTRUCTION AND INSTALLATION DETAILS

0.0 - 1.0 ft bgs: Cement

1.0 - 98.0 ft bgs: Bentonite Grout

2-inch flush-threaded solid PVC

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 25, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: MW-OB-51A

CLIENT:	US Ecology	START DATE:	March 25, 2019	ELEVATION:	717.8 ft
PROJECT:	US Ecology - Site 2	END DATE:	March 26, 2019	COORDINATES:	N: 6970.1 ft E: 4333.3 ft
PROJECT NO:	19118008			COORD SYS:	SP MI South FIPS 2113 Ft
LOCATION:	Belleville, MI	CONTRACTOR:	Stock Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
41	LS 250 Mini-Sonic	Roto-Sonic (4-inch rods to 100', 6-inch rods to 20')	SILTY CLAY, trace gravel, trace fine to coarse sand, gray, moist. Silt partings at 61.1 and 63 feet bgs.	CL-ML			5	SC	100								
42																	
43																	
44																	
45																	
46																	
47																	
48																	
49																	
50																	1.0 - 98.0 ft bgs: Bentonite Grout
51																	
52																	2-inch flush-threaded solid PVC
53																	
54																	
55							6	SC	100								
56																	
57																	
58																	
59																	
60																	
61																	
62																	
63																	
64						653.2											
65			CLAYEY SILT, gray, very moist.	ML		64.6	7	SC	100								
66																	
67																	
68																	
69																	
70																	
71																	
72																	
73																	
74																	
75							8	SC	100								
76																	
77																	
78																	
79																	
80			Continued on Next Page														

Hammer: ASTM D1586, Blows per 6 in, 140-lb hammer, 30 in drop

WATER CONTENT PERCENT: H–H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic

SHEAR STRENGTH: X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ○ ● ∪ ∩

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 25, 2019

CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: MW-OB-51A

CLIENT:	US Ecology	START DATE:	March 25, 2019	ELEVATION:	717.8 ft
PROJECT:	US Ecology - Site 2	END DATE:	March 26, 2019	COORDINATES:	N: 6970.1 ft E: 4333.3 ft
PROJECT NO:	19118008			COORD SYS:	SP MI South FIPS 2113 Ft
LOCATION:	Belleville, MI	CONTRACTOR:	Stock Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
81	LS 250 Mini-Sonic	Roto-Sonic (4-inch rods to 100', 6-inch rods to 20')	CLAYEY SILT, gray, very moist.	ML		633.8											
84			SANDY CLAY, some gravel, some fine to coarse sand, gray, moist.	CL		84.0 / 632.8	9	SC	100								
85			SAND with gravel, loose, gray, wet.	SP		85.0											
86			SANDY CLAY, fine to medium grained, trace gravel, some silt, gray, dry.	CL		632.3 / 85.5 / 630.2											
88			SAND, some silt, gray, moist.	SP		87.6											
89			SILTY CLAY, trace gravel, some fine to medium sand, hard, gray, dry, several dry silt partings. Wet silt seam at 93 feet bgs.	CL		629.8 / 88.0	10	SC	100								
100						617.8											98.0 - 101.0 ft bgs: Hydrated Bentonite Pellets
100			SAND with gravel, trace silt, gray, wet.	SP		100.0	11	SC	100								101.0 - 110.0 ft bgs: Medium Well Gravel
109						607.8											0.010-inch slotted PVC screen
110			End of hole at 110.0 ft.														
120																	

1.0 - 98.0 ft bgs: Bentonite Grout

2-inch flush-threaded solid PVC

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 25, 2019

CHECKED: Sean Paulsen DATE: Apr 18, 2019

April 24, 2019 Project No. 19118008

Sylwia Scott
US Ecology
49350 North I-94 Service Drive
Belleville, MI 48111

WELL ABANDONMENT AND REPLACEMENT
WAYNE DISPOSAL, INC. SITE 2

Dear Ms. Scott:

Golder Associates Inc. (Golder) has prepared this correspondence to document the abandonment of three (3) observation wells and the installation of one (1) replacement well at the Wayne Disposal, Inc. (WDI) Site 2 property, located in Belleville, Michigan (Site). The well abandonment and replacement activities were required as a result of the encroachment of landfill activities on the well locations. Specifically, a waste transfer box is to be constructed over the location of two of the observation wells, while lateral expansion of the active landfill will occur over the location of the third abandonment. The workplan for well abandonment and replacement activities was approved by the Michigan Department of Environmental Quality on March 22, 2019.

FIELD ACTIVITIES

Well Installation

One replacement well (MW-OB-51-A) was installed to replace existing well MW-OB-51. The replacement well was installed using rotosonic drilling technology. As shown on the attached boring log and well construction diagram, the soil boring was advanced to 110 feet below ground surface (bgs) using 4-inch sonic drilling rods. Samples were collected continuously during drilling. Because of the potential for unknown debris materials to be present in the upper fifteen feet of the soil profile, 6-inch sonic rods were advanced outside the 4-inch rods (referred to as an “override casing”) to reduce the potential for drag-down impacts from the waste materials. The tip of the 6-inch override casing was advanced to 20 feet bgs. As shown on the boring log, waste materials were encountered between 13.5 and 14.5 feet bgs.

Soils were described during drilling and recorded in the field. The boring log includes soil type, color, grain size, and moisture content information for each soil type encountered. Following completion of the soil boring, the replacement monitoring well was constructed inside the drill rods before they were removed from the ground.

Replacement observation well MW-OB-51-A was contructed of 2-inch solid, flush-threaded polyvinyl chloride (PVC) risers fitted with a 5-foot-long, 0.010-inch slot PVC screen, with a bottom depth of 110 feet bgs. The top of the well casing was completed with a stickup of approximately 2.5 feet above ground surface. A nine-foot long, medium grained sand filter pack was placed in the annulus around the well screen. The drill rods were slowly

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retracted from the borehole as the annular backfill was emplaced; the vibration from removal of the sonic rods assists with settlement of the backfill materials.

Following placement of the sand filter pack, a 3-foot thick bentonite pellet seal was placed on top of the filter sand to control grout penetration into the sand. The remainder of the well annulus was sealed with a thick, bentonite grout from the top of the bentonite pellet seal to two feet below ground surface. A lockable, steel protective casing was installed over the above-ground portion of the well casing. The base of the protective casing was set in a cement pad, which was sloped away from the protective casing to promote drainage away from the base of the well.

Well installation was started on March 25, 2019 and completed on March 26, 2019. Following installation, well MW-OB-51-A was developed by surging and purging with a submersible pump. Development activities were performed for three separate 45 minute intervals on March 27, 2019 (1 interval) and March 29, 2019 (2 intervals). The development was continued until the turbidity of the purged water was minimized.

Following completion of the monitoring well installation activities, the well was surveyed on March 29, 2019. Survey location and elevation data are shown on the attached boring log and well construction diagram.

Well Abandonment

A total of three (3) observation wells (OB-34A, OB-35A, and MW-OB-51) were abandoned by overdrilling using rotosonic drilling methods. In each case, the goals was the complete remove the well casing. However, prior to overdrilling, the well casing of each of the three wells was completely filled with bentonite grout in the event that the well casing was severed during extraction. In each case, six-inch or eight-inch rotosonic drill rods (the size of the rods used for abandonment was based on the borehole diameter of the original well installation). In each case, the drill rods were extended to the bottom depth of the original borehole. Well abandonment logs are attached with details of the abandonment activities.

For MW-OB-51, the well log indicated that “Trace Debris” was present in the upper 15 feet of the soil profile. Out of an abundance of precaution, a ten-inch override casing was placed to a tip depth of 20 feet bgs. The tip of the ten-inch rods were bedded into silty clay, based on the original boring log, to reduce the potential for drag-down of contaminants during the abandonment. Eight-inch diameter sonic rods were then extended to 110 feet below ground surface.

Once the target depth was reached, an attempt was made to remove the well casing by pulling from the surface. For well MW-OB-51, none of the PVC well materials were recovered. According to the driller, it is not uncommon for the sonic method to shatter the PVC well materials which accumulate at the bottom of the borehole as the abandoment proceeds. For well OB-34A, the upper 60 feet of stainless-steel well casing was removed from the ground, with the bottom 30 feet of not recovered and remaining in the ground. For well OB-35A, the upper 60 feet of stainless-steel well casing was severed and lost in the borehole, ultimately being driven to the bottom borehole at 129.3 feet bgs.

Following the removal of as much of the installed well components as possible, each borehole was then tremie grouted under low pressure using bentonite grout to provide a seal against to the natural geologic materials that were pentrated by the wellbore. The sonic rods were slowly removed from the borehole as the grout was being placed to allow the grout to completely fill the wellbore.

The bottom of the tremie pipe was kept in contact with the grout during introduction to prevent air pockets from forming during emplacement. In each case, the wellbore was sealed from the bottom of the wellbore up to approximately ground surface. The grout sealant was inspected for settlement at least twenty four (24) hours after placement, and additional grout or bentonite chips were added, as needed, where settlement was noted. Well abandonment details, including borehole diameter, total depth, grout type, and amout of grout used were documented in the field by Golder field personnel. These details are recorded on the attached borehole abandonment logs.

We appreciate the opportunity to submit this proposal to you and look forward to working with you on this project. If you have any questions regarding this proposal, please call the undersigned at 248-295-0135.

Sincerely,

Golder Associates Inc.

Adam C. Near, CPG
Project Geologist

Sean C. Paulsen, PG
Associate/Senior Consultant

ACN/SCP

Attachment: Boring log and well construction diagram MW-OB-51-A
Well abandonment records MW-OB-51, OB-34A, and OB-35A

RECORD OF BOREHOLE: MW-OB-51A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

START DATE: March 25, 2019
END DATE: March 26, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 717.8 ft
COORDINATES: N: 6970.1 ft E: 4333.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DRILL RIG: LS 250 Mini-Sonic
DRILL METHOD: Roto-Sonic (4-inch rods to 100', 6-inch rods to 20')

DEPTH (ft)	DESCRIPTION	USCS	ELEV. DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES REC %	SAMPLES BLOWS (Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop)	SAMPLES N-VALUE	WATER CONTENT PERCENT (H Plastic & Liquid Limits (%); O Water Content (%); NP Nonplastic)	SHEAR STRENGTH (X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U)	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	SILTY CLAY with organics.	CL-ML	0.0											0.0 - 1.0 ft bgs: Cement
1	SANDY CLAY, some gravel, some fine to medium sand, brown, moist.	CL	717.3											
2			0.5											
3			714.8											
4	SILTY CLAY, some gravel, some fine to course sand, gray, moist.		3.0											
5				1	SC	100								
6														
7														
8														
9			708.8											
10	SILTY CLAY with fine to coarse sand, some organics, trace gravel, gray to dark gray, moist.		9.0 707.8											
11	SILTY CLAY, some gravel, some fine to coarse sand, gray, moist. Debris (concrete, wood, brick, plastic), dry, from 13.5 to 14.5 feet bgs.		10.0											
12														
13														
14			703.3											
15	SILTY CLAY, trace gravel, trace fine to coarse sand, gray, moist. Silt partings at 61.1 and 63 feet bgs.		14.5	2	SC	100								1.0 - 98.0 ft bgs: Bentonite Grout
16														
17														2-inch flush-threaded solid PVC
18														
19														
20														
21		CL-ML												
22														
23														
24														
25				3	SC	100								
26														
27														
28														
29														
30														
31														
32														
33														
34														
35				4	SC	100								
36														
37														
38														
39														
40	Continued on Next Page													

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 25, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: MW-OB-51A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

START DATE: March 25, 2019
END DATE: March 26, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 717.8 ft
COORDINATES: N: 6970.1 ft E: 4333.3 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DRILL RIG: LS 250 Mini-Sonic
DRILL METHOD: Roto-Sonic (4-inch rods to 100', 6-inch rods to 20')

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	REC %	BLOWS	N-VALUE
41–80	SILTY CLAY, trace gravel, trace fine to coarse sand, gray, moist. Silt partings at 61.1 and 63 feet bgs.	CL-ML		5	SC	100		
				6	SC	100		
64			653.2	7	SC	100		
65	CLAYEY SILT, gray, very moist.	ML	64.6	8	SC	100		
80	Continued on Next Page							

Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

WATER CONTENT PERCENT: Plastic & Liquid Limits (%); Water Content (%); NP Nonplastic; 0 20 40 60 80 100

SHEAR STRENGTH: Nat Vane; Rem Vane; Pocket Pen; Q; U; 0 20 40 60 80 100

ADDITIONAL LAB TESTING

ADDITIONAL OBSERVATIONS

GROUNDWATER OBSERVATIONS

CONSTRUCTION AND INSTALLATION DETAILS

1.0 - 98.0 ft bgs: Bentonite Grout

2-inch flush-threaded solid PVC

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 25, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: MW-OB-51A

CLIENT:	US Ecology	START DATE:	March 25, 2019	ELEVATION:	717.8 ft
PROJECT:	US Ecology - Site 2	END DATE:	March 26, 2019	COORDINATES:	N: 6970.1 ft E: 4333.3 ft
PROJECT NO:	19118008			COORD SYS:	SP MI South FIPS 2113 Ft
LOCATION:	Belleville, MI	CONTRACTOR:	Stock Drilling	HORZ DATUM:	NAD83 VERT DATUM: NAVD88

DRILL RIG: LS 250 Mini-Sonic

DRILL METHOD: Roto-Sonic (4-inch rods to 100', 6-inch rods to 20')

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES REC %	SAMPLES BLOWS	SAMPLES N-VALUE
81	CLAYEY SILT, gray, very moist.	ML	633.8					
84	SANDY CLAY, some gravel, some fine to coarse sand, gray, moist.	CL	84.0 / 632.8	9	SC	100		
85	SAND with gravel, loose, gray, wet.	SP	85.0					
86	SANDY CLAY, fine to medium grained, trace gravel, some silt, gray, dry.	CL	632.3					
87			85.5 / 630.2					
88	SAND, some silt, gray, moist.	SP	87.6					
89	SILTY CLAY, trace gravel, some fine to medium sand, hard, gray, dry, several dry silt partings. Wet silt seam at 93 feet bgs.	CL	629.8 / 88.0	10	SC	100		
100			617.8					
100	SAND with gravel, trace silt, gray, wet.	SP	100.0	11	SC	100		
110			607.8					
110	End of hole at 110.0 ft.							

WATER CONTENT PERCENT: Plastic & Liquid Limits (%); Water Content (%); NP Nonplastic; 0 20 40 60 80 100

SHEAR STRENGTH: Nat Vane; Rem Vane; Pocket Pen; Q; U; 0 20 40 60 80 100

ADDITIONAL LAB TESTING

ADDITIONAL OBSERVATIONS

GROUNDWATER OBSERVATIONS

CONSTRUCTION AND INSTALLATION DETAILS

- 1.0 - 98.0 ft bgs: Bentonite Grout
- 2-inch flush-threaded solid PVC
- 98.0 - 101.0 ft bgs: Hydrated Bentonite Pellets
- 101.0 - 110.0 ft bgs: Medium Well Gravel
- 0.010-inch slotted PVC screen

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 25, 2019

CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: MW-OB-51

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

DATE: March 26, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 715.5 ft
COORDINATES: N: 6971.5 ft E: 4527.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE (Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop)	WATER CONTENT PERCENT (H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic)	SHEAR STRENGTH (X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U)	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
1–40	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.			0.0									0.00 - 110.00 ft: PVC not recovered; driller noted that PVC pipe is usually destroyed during abandonment by sonic method and driven to bottom of borehole.		0.0 - 110.0 ft bgs: Bentonite Grout

Continued on Next Page

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 26, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: MW-OB-51

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI
DATE: March 26, 2019
CONTRACTOR: Stock Drilling
ELEVATION: 715.5 ft
COORDINATES: N: 6971.5 ft E: 4527.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
41–80	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.														0.0 - 110.0 ft bgs: Bentonite Grout
			Continued on Next Page														

Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

WATER CONTENT PERCENT: H Plastic & Liquid Limits (%); O Water Content (%); NP Nonplastic; 0 20 40 60 80 100

SHEAR STRENGTH: X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U; 0 20 40 60 80 100

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 26, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: MW-OB-51

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

DATE: March 26, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 715.5 ft
COORDINATES: N: 6971.5 ft E: 4527.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
81–109	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.														0.0 - 110.0 ft bgs: Bentonite Grout
110			End of hole at 110.0 ft.			605.5											
111–120																	

Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

WATER CONTENT PERCENT: H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic; 0 20 40 60 80 100

SHEAR STRENGTH: X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U; 0 20 40 60 80 100

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 26, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: OB-34A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

DATE: March 28, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 707.1 ft
COORDINATES: N: 7636.2 ft E: 5045.7 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
1–40	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.			0.0									0.00 - 60.00 ft Filled well casing with grout prior to abandonment. Well casing cut at 60 feet bgs.		0.0 - 90.0 ft bgs: Bentonite Grout

Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

WATER CONTENT PERCENT: H Plastic & Liquid Limits (%); O Water Content (%); NP Nonplastic; scale 0 20 40 60 80 100

SHEAR STRENGTH: X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U; scale 0 20 40 60 80 100

Continued on Next Page

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 28, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: OB-34A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

DATE: March 28, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 707.1 ft
COORDINATES: N: 7636.2 ft E: 5045.7 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
41–80	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.												60.00 - 90.00 ft: Bottom 30 feet of well casing remains in place at bottom of original borehole.		0.0 - 90.0 ft bgs: Bentonite Grout

Samples — Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

Water Content Percent — H: Plastic & Liquid Limits (%); O: Water Content (%); NP: Nonplastic; scale 0 20 40 60 80 100

Shear Strength — X: Nat Vane; ⊗: Rem Vane; ■: Pocket Pen; ●: Q; ○: U; scale 0 20 40 60 80 100

Continued on Next Page

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 28, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: OB-34A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI
DATE: March 28, 2019
CONTRACTOR: Stock Drilling
ELEVATION: 707.1 ft
COORDINATES: N: 7636.2 ft E: 5045.7 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
81–89	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.														0.0 - 90.0 ft bgs: Bentonite Grout
90			End of hole at 90.0 ft.			617.1											
91–120																	

SAMPLES: Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

WATER CONTENT PERCENT: H Plastic & Liquid Limits (%); O Water Content (%); NP Nonplastic; 0 20 40 60 80 100

SHEAR STRENGTH: X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U; 0 20 40 60 80 100

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 28, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: OB-35A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

DATE: March 28, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 706.8 ft
COORDINATES: N: 7628.4 ft E: 5044.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
1–40	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.			0.0									0.00 - 60.00 ft Filled well casing with grout prior to abandonment. Well casing cut at 60 feet bgs. Upper 60 foot section shoved to bottom of hole.		0.0 - 129.3 ft bgs: Bentonite Grout

Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

WATER CONTENT PERCENT: Plastic & Liquid Limits (%); Water Content (%); NP Nonplastic

SHEAR STRENGTH: Nat Vane; Rem Vane; Pocket Pen; Q; U

Continued on Next Page

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 28, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: OB-35A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI

DATE: March 28, 2019
CONTRACTOR: Stock Drilling

ELEVATION: 706.8 ft
COORDINATES: N: 7628.4 ft E: 5044.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
41–80	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.												60.00 - 130.00 ft: 70 feet of well casing remains in place at bottom of original borehole.		0.0 - 129.3 ft bgs: Bentonite Grout

Samples: Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

Water Content Percent: H Plastic & Liquid Limits (%); O Water Content (%); NP Nonplastic; 0 20 40 60 80 100

Shear Strength: X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U; 0 20 40 60 80 100

Continued on Next Page

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 28, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: OB-35A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI
DATE: March 28, 2019
CONTRACTOR: Stock Drilling
ELEVATION: 706.8 ft
COORDINATES: N: 7628.4 ft E: 5044.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE (Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop)	WATER CONTENT PERCENT (H Plastic & Liquid Limits (%); O Water Content (%); NP Nonplastic)	SHEAR STRENGTH (X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U)	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
81–120	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.														0.0 - 129.3 ft bgs: Bentonite Grout
			Continued on Next Page														

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 28, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

RECORD OF BOREHOLE: OB-35A

CLIENT: US Ecology
PROJECT: US Ecology - Site 2
PROJECT NO: 19118008
LOCATION: Belleville, MI
DATE: March 28, 2019
CONTRACTOR: Stock Drilling
ELEVATION: 706.8 ft
COORDINATES: N: 7628.4 ft E: 5044.8 ft
COORD SYS: SP MI South FIPS 2113 Ft
HORZ DATUM: NAD83 VERT DATUM: NAVD88

DEPTH (ft)	DRILL RIG	DRILL METHOD	SOIL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT PERCENT	SHEAR STRENGTH	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
121–129	LS 250 Mini-Sonic	Roto-Sonic (6-inch rods)	See original NTH Consultants boring log for lithology. Well casing was over-drilled.			577.5											0.0 - 129.3 ft bgs: Bentonite Grout
129			End of hole at 129.3 ft.														

Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30 in drop

WATER CONTENT PERCENT: H Plastic & Liquid Limits (%); O Water Content (%); NP Nonplastic; 0 20 40 60 80 100

SHEAR STRENGTH: X Nat Vane; ⊗ Rem Vane; ■ Pocket Pen; ● Q; ○ U; 0 20 40 60 80 100

DEPTH SCALE: 1:212

REV: A

GOLDER

LOGGED: Dayna Kent DATE: Mar 28, 2019
CHECKED: Sean Paulsen DATE: Apr 18, 2019

Attachment C

Chain of Custody &
Monitoring Well Damage Report

CHAIN-OF-CUSTODY Analytical Request Document

Pace Analytical®

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE ONLY- Affix Workorder/Login Label Here or List Pace Workorder Number or MTJL Log-in Number Here

ALL SHADED AREAS are for LAB USE ONLY

Company:	Billing Information:
Address:	
Report To:	Email To:
Copy To:	Site Collection Info/Address: 49350 N. I-94 Service Drive
Customer Project Name/Number:	State: County/City: Time Zone Collected: [ ] PT [ ] MT [ ] CT [ ] ET
Phone: Email:	Site/Facility ID #: / Compliance Monitoring? [ ] Yes [ ] No
Collected By (print):	Purchase Order #: Quote #: / DW PWS ID #: DW Location Code:
Collected By (signature):	Turnaround Date Required: / Immediately Packed on Ice: [ ] Yes [ ] No
Sample Disposal: [ ] Dispose as appropriate [ ] Return [ ] Archive: _____ [ ] Hold:_____	Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply) / Field Filtered (if applicable): [ ] Yes [ ] No Analysis: _____

Container Preservative Type **

Lab Project Manager:

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other _____

Analyses

Lab Profile/Line:

Lab Sample Receipt Checklist:

Custody Seals Present/Intact	Y N NA
Custody Signatures Present	Y N NA
Collector Signature Present	Y N NA
Bottles Intact	Y N NA
Correct Bottles	Y N NA
Sufficient Volume	Y N NA
Samples Received on Ice	Y N NA
VOA - Headspace Acceptable	Y N NA
USDA Regulated Soils	Y N NA
Samples in Holding Time	Y N NA
Residual Chlorine Present	Y N NA
Cl Strips: _____	
Sample pH Acceptable	Y N NA
pH Strips: _____	
Sulfide Present	Y N NA
Lead Acetate Strips: _____	

LAB USE ONLY:
Lab Sample # / Comments:

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected (or Composite Start) Time	Composite End Date	Composite End Time	Res Cl	# of Ctns

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None

Packing Material Used:

Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A

Lab Tracking #:

Samples received via: FEDEX UPS Client Courier Pace Courier

Lab Sample Temperature Info:
Temp Blank Received: Y N NA
Therm ID#: _____
Cooler 1 Temp Upon Receipt: _____oC
Cooler 1 Therm Corr. Factor: _____oC
Cooler 1 Corrected Temp: _____oC
Comments:

Relinquished by/Company: (Signature) Attachment C-1	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:

MTJL LAB USE ONLY

Table #:
Acctnum:
Template:
Prelogin:
PM:
PB:

Trip Blank Received: Y N NA
HCL MeOH TSP Other

Non Conformance(s): YES / NO

Page: _____ of: _____

Wayne Disposal Monitoring Well Inspection/Damage Report

Inspector: _____ **Date:** _____

Place a check-mark for any of the items that are not acceptable and provide comments below

Submit this form immediately to the site manager and the regulatory affairs manager or their designee

**OB-54, 55, 58,59 to be installed as phases of landfill construction occur.

Well ID	Lock	Seal	Pro. Casing	Markings	Pump	Casing	Details of Problems Encountered	Actions Required to Remedy
OB-1A								
OB-2A								
OB-3								
OB-4								
OB-5								
OB-6/56								
OB-7								
OB-8/60								
OB-9								
OB-10								
OB-11A								
OB-12R								
OB-13/57								
OB-14								
OB-15								
OB-16								
OB-18								
OB-19R								
OB-20								
OB-21								
OB-22								
OB-23A								
OB-24								
OB-25								
OB-26A								
OB-27A								
OB-28								
OB-29								
OB-30								
OB-31AR								
OB-32								
OB-36								
OB-37								
OB-38								
OB-39								
OB-40R								
OB-41								
OB-42								
OB-43								
OB-44								
OB-45								
OB-46								
OB-47								
OB-48								
OB-49								
OB-50								
OB-51A								
OB-52								
OB-53								

Attachment D

Operating Procedures for the Water Level Indicator

INSTRUCTION MANUAL

ET-89

ELECTRIC TAPE

Attachment D

KECK INSTRUMENTS, INC

KECK TAPE GUARD

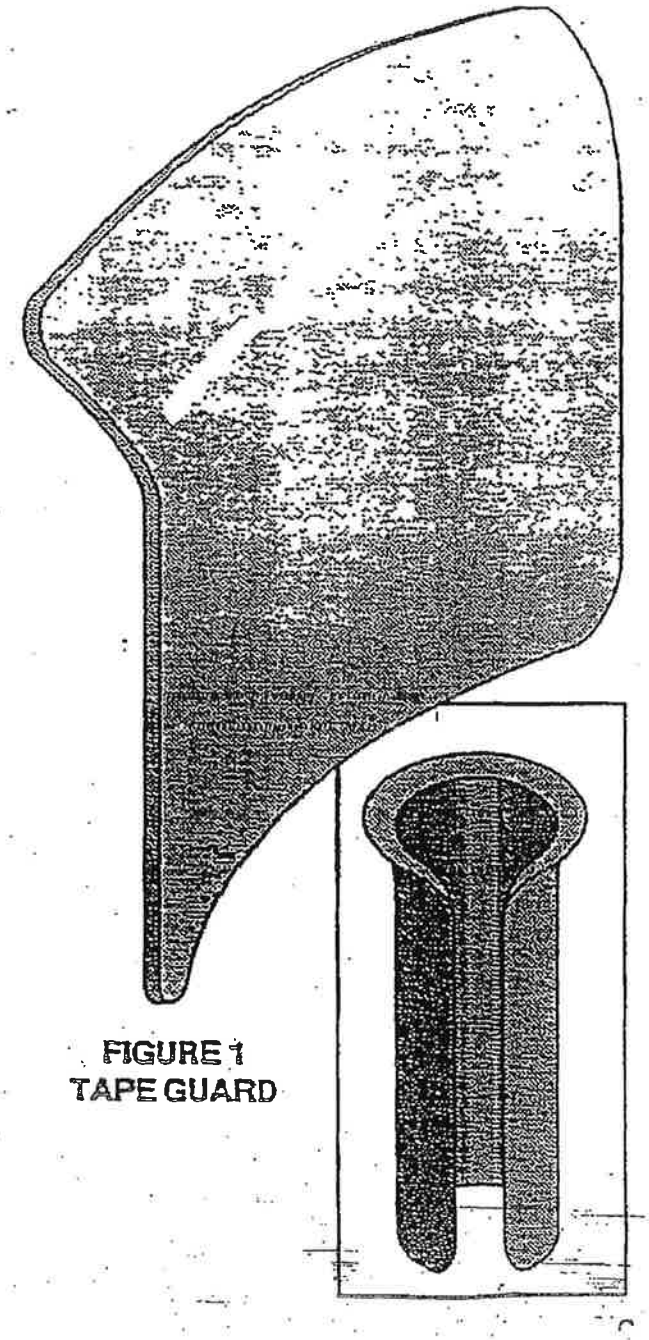


FIGURE 1
TAPE GUARD

The Keck "Tape Guard" was developed to protect instrumentation, tapes and sample tubing from the wearing edges of well casing. Made of smooth flexible polystyrene, the "Tape Guard" easily adapts to any 2" or 4" well.

Instructions

Simply compress the "Tape Guard" and insert

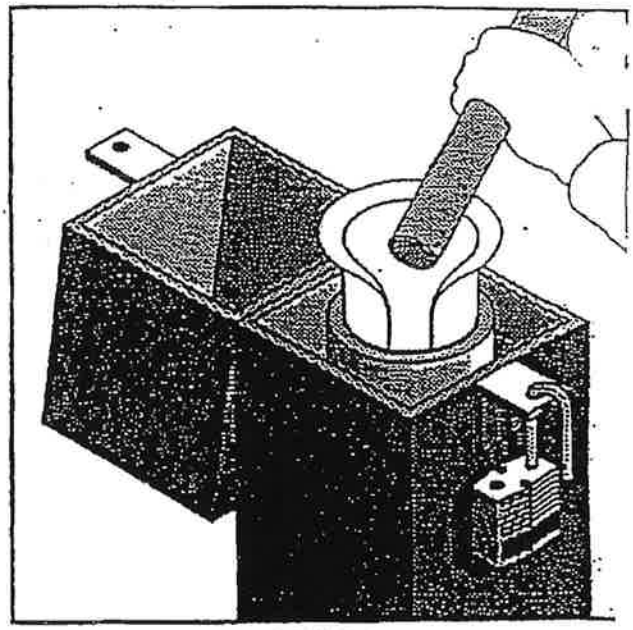


FIGURE 2
TAPE GUARD USAGE

into the opening of any 2" to 4" well pipe. Allow instrumentation, tubing or tape to ride on the smooth surface of the "Tape Guard" to prevent wear.

ET-89

The Keck Instruments ET-89 is a portable reel mounted device used to accurately measure water levels in a borehole. Water levels are detected by a 5/8" O.D. stainless steel probe attached to a 100 FT. Tefzel coated engineer's tape. The tape is graduated in 100ths of a foot with metric divisions on the reverse side. The ET-89 relies on fluid conductivity to determine the presence of water and emits on audible signal with light. Controls include a sensitivity adjustment to eliminate false readings due to cascading water or casing effect and a battery test switch.

Operational Procedure

1. Turn the instrument "On" and check the battery voltage by pressing the "Batt Test" button. A dim red light indicates a low battery and should be replaced.
2. Lower the probe down the well to the water surface, the light and buzzer should be activated. At this point adjust the probe sensitivity counter-clockwise until the light and buzzer turn off.
3. With the probe still in contact with the water, adjust the probe sensitivity until the light and buzzer barely activate. In this setting the probe will detect water level and not be effected by condensation from the casing well.
4. Water level measurements can now be taken from the top of the casing.
5. After completion of water level measurements the device should be properly stored.

Maintenance and Cleaning Procedures

1. Remove the three faceplate screws.
2. Release the faceplate using the sensitivity knob to pull the components out of the reel.
3. Make note of the battery location on the circuit board and the position in reel cavity.
4. Remove the 9 volt battery from the connector by grasping the battery and the black connector. Replace with new battery.
5. Position the battery in the notch of the circuit board and align the battery with the recessed slot in the reel.
6. Place the faceplate in the reel and replace the three retaining screws. Do not over tighten these screws.

Decontamination and Cleaning

The ET-89 can be cleaned with any detergent or lab soap such as Liquinox that does not effect polypropylene. The reel should not be submerged at any time but can be wiped with a damp cloth.

Please call our technical staff if further assistance is required at 1-800-542-5681.

Attachment E

Summary of Monitoring Well Information

Attachment E

MONITORING WELL INFORMATION
WAYNE DISPOSAL SITE #2 LANDFILL

WELL ID	PROGRAM(S)	T.O.C. ELEV.	SCREEN ELEV.**	WELL DEPTH	DESIG.	STRATUM SCREENED	WELL PAIR
OB-1A	Part 115	705.99	579.9	126	UG	SILT/ROCK	--
OB-2A	Part 115/MCIX	701.30	587.8	114	DG	SAND	OB-44
OB-3	Part 115	708.99	577.9	131	DG	SAND	--
OB-4	Part 115	712.59	638.9	74	UG	SAND	--
OB-5	Part 115	705.20	603.8	101	DG	SAND	--
OB-6/OB-56	Part 115/Part 111*	704.75	627.1	78	DG	SAND	--
OB-7	Part 115/MCIX	703.58	627	77	UG	SILT/SAND	OB-32
OB-8/OB-60	Part 115/Part 111*	707.58	629	79	DG	SAND	--
OB-9	Part 115	701.20	614.1	87	DG	SAND	--
OB-10	Part 115	707.80	621	87	DG	SAND	--
OB-11A	Part 115/MCIX	698.99	611.4	88	DG	SAND	--
OB-12R	Part 115	707.84	620.6	87	DG	SAND	OB-55
OB-13/OB-57	Part 115/Part 111*	703.27	619.9	83	DG	SAND	--
OB-14	Part 115	702.10	600.1	102	DG	SAND	--
OB-15	Part 115	707.63	617.3	90	DG	SAND	--
OB-16	Part 115	700.83	596.5	104	DG	SAND	--
OB-18	Part 111 (MDWTP)	703.11	589.2	114	UG	CLAY/ROCK	--
OB-19R	Part 111 (MDWTP)	709.17	585.6	124	UG	ROCK	--
OB-20	Part 111/TSCA	706.28	609.9	96	DG	SAND	--
OB-21	Part 111(MDWTP)/TSCA	705.00	600.9	104	DG	SAND	OB-36
OB-22	Part 111	704.00	568.3	136	DG	SAND/ROCK	OB-24
OB-23A	Part 111(MDWTP)/TSCA	702.67	577.5	125	DG	SAND	--
OB-24	Part 111(MDWTP)/TSCA	704.59	614.4	90	DG	SAND	OB-22
OB-25	Part 111/TSCA	711.00	620	91	DG	SAND	OB-37
OB-26A	Part 111/TSCA	714.15	628.5	86	DG	SAND	OB-38
OB-27A	Part 111	708.27	636.5	72	DG	SAND	OB-28
OB-28	Part 111	709.00	583.9	125	DG	SAND	OB-27A
OB-29	Part 111	705.53	609.4	96	DG	SAND	OB-39
OB-30	Part 111	703.92	607.4	97	DG	SAND	--
OB-31AR	Part 111/MCIX	700.65	628.1	73	UG	SAND	OB-32
OB-32	Part 111/MCIX	701.49	565.3	136	UG	ROCK	OB-31AR
OB-36	Part 111 (MDWTP)	702.13	572.1	130	DG	ROCK	OB-21
OB-37	Part 111	711.30	572.7	139	DG	ROCK	OB-25
OB-38	Part 111	714.10	573.4	141	DG	ROCK	OB-26A
OB-39	Part 111	707.55	561.9	146	DG	ROCK	OB-29
OB-40R	Part 111/TSCA	708.84	610.2	99	UG	SILT/SAND	--
OB-41	MCIX	701.89	562	140	DG	ROCK	--
OB-42	MCIX	717.25	624.4	93	DG	SAND	OB-43
OB-43	MCIX	717.46	595.1	122	DG	SAND	OB-42
OB-44	MCIX	701.27	639.5	62	DG	SAND	OB-2
OB-45	Part 115/MCIX	701.31	628	73	DG	SAND	OB-46
OB-46	MCIX	701.19	600	101	DG	SAND	OB-45
OB-47	Part 111 (MDWTP)	702.70	594.3	108	DG	SAND	--
OB-48	Part 111/TSCA	708.70	614.2	94.5	DG	SAND	--
OB-49	Part 111/TSCA	708.01	572.5	135.5	DG	ROCK	OB-53
OB-50	Part 111/TSCA	715.43	602.4	113.0	DG	SAND	--
OB-51A	Part 111/TSCA				DG	SAND	--
OB-52	Part 111/TSCA	709.24	620.9	88.3	DG	SAND	--
OB-53	Part 111/TSCA	707.01	600.8	106.21	DG	SAND	OB-49
OB-54	Part 111/TSCA	To be installed				SAND	--
OB-55	Part 111/TSCA	To be installed				ROCK	OB-12R
OB-58	Part 111/TSCA	To be installed				SAND	OB-59
OB-59	Part 111/TSCA	To be installed				ROCK	OB-58

UG = Upgradient Well DG = Downgradient Well

* to become Part 111 well when Cell G Phase 1 wells are abandined

** bottom elevation of 5-foot screen

Attachment E

GROUNDWATER MONITORING WELL INFORMATION

WELL ID	PROGRAM(S)	STRATUM SCREENED
OB-1A	SWMA	Uppermost usable aquifer; lower bedrock
OB-2A	SWMA/MCIX	Uppermost usable aquifer; upper glacial sand
OB-3	SWMA	Uppermost usable aquifer; upper glacial sand
OB-4	SWMA	Uppermost usable aquifer; upper glacial sand
OB-5	SWMA	Uppermost usable aquifer; upper glacial sand
OB-6/OB-56	SWMA/HWMA*	Uppermost usable aquifer; upper glacial sand
OB-7	SWMA/MCIX	Uppermost usable aquifer; upper glacial sand
OB-8/OB-60	SWMA/HWMA*	Uppermost usable aquifer; upper glacial sand
OB-9	SWMA	Uppermost usable aquifer; upper glacial sand
OB-10	SWMA	Uppermost usable aquifer; upper glacial sand
OB-11A	SWMA/MCIX	Uppermost usable aquifer; upper glacial sand
OB-12R	SWMA	Uppermost usable aquifer; upper glacial sand
OB-13/OB-57	SWMA/HWMA*	Uppermost usable aquifer; upper glacial sand
OB-14	SWMA	Uppermost usable aquifer; upper glacial sand
OB-15	SWMA	Uppermost usable aquifer; upper glacial sand
OB-16	SWMA	Uppermost usable aquifer; upper glacial sand
OB-18	HWMA (WDI/MDWTP)	Uppermost usable aquifer; lower bedrock
OB-19R	HWMA (WDI/MDWTP)	Uppermost usable aquifer; upper glacial sand
OB-20	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-21	HWMA(WDI/MDWTP)/TSCA	Uppermost usable aquifer; upper glacial sand
OB-22	HWMA	Uppermost usable aquifer; lower bedrock
OB-23A	HWMA(WDI/MDWTP)/TSCA	Uppermost usable aquifer; upper glacial sand
OB-24	HWMA(WDI/MDWTP)/TSCA	Uppermost usable aquifer; upper glacial sand
OB-25	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-26A	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-27A	HWMA	Uppermost usable aquifer; upper glacial sand
OB-28	HWMA	Uppermost usable aquifer; upper glacial sand
OB-29	HWMA	Uppermost usable aquifer; upper glacial sand
OB-30	HWMA	Uppermost usable aquifer; upper glacial sand
OB-31AR	HWMA/MCIX	Uppermost usable aquifer; upper glacial sand
OB-32	HWMA/MCIX	Uppermost usable aquifer; lower bedrock
OB-36	HWMA (WDI/MDWTP)	Uppermost usable aquifer; lower bedrock
OB-37	HWMA	Uppermost usable aquifer; lower bedrock
OB-38	HWMA	Uppermost usable aquifer; lower bedrock
OB-39	HWMA	Uppermost usable aquifer; lower bedrock
OB-40R	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-41	MCIX	Uppermost usable aquifer; lower bedrock
OB-42	MCIX	Uppermost usable aquifer; upper glacial sand
OB-43	MCIX	Uppermost usable aquifer; upper glacial sand
OB-44	MCIX	Uppermost usable aquifer; upper glacial sand
OB-45	SWMA/MCIX	Uppermost usable aquifer; upper glacial sand
OB-46	MCIX	Uppermost usable aquifer; upper glacial sand
OB-47	HWMA (WDI/MDWTP)	Uppermost usable aquifer; upper glacial sand
OB-48	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-49	HWMA/TSCA	Uppermost usable aquifer; lower bedrock
OB-50	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-51A	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-52	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-53	HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-54	Future HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-55	Future HWMA/TSCA	Uppermost usable aquifer; lower bedrock
OB-58	Future HWMA/TSCA	Uppermost usable aquifer; upper glacial sand
OB-59	Future HWMA/TSCA	Uppermost usable aquifer; lower bedrock

* to become HWMA well when Cell G Phase 1 wells are abandined

Attachment F

WELL WIZARD
Dedicated Sampling Systems

Installation, Operation and Maintenance User's Guide
Part No 34999

WELL WIZARD®

Dedicated sampling systems

Installation, Operation, and Maintenance User's Guide

Part No. 34999

QED

Ground Water Specialists™

6095 Jackson Rd.
P.O. Box 3726
Ann Arbor, MI 48106
800-624-2026 In Michigan 313-995-2547
In California 510-930-7610 or 800-366-7610

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1

INTRODUCING WELL WIZARD

To monitor the quality of ground water, you need an efficient way to collect unbiased samples. Well Wizard is a total system for meeting all your ground water monitoring needs–with the flexibility to meet your special requirements. This chapter describes the components of the Well Wizard system.

The Well Wizard system includes both *dedicated* and *portable* components. The water-contacting components are dedicated; you permanently install them in each well. The control elements are portable; you transport them from well to well.

Dedicated Components

Dedicated Well Wizard components include:

- A sampling pump.
- Pump tubing.
- An optional inlet screen.
- A well cap.
- An optional pneumatic static water-level probe.
- An optional packer.
- An optional purge pump.

The following sections describe these components.

Sampling Pump

A Well Wizard sampling pump is an air-actuated bladder pump that you permanently position in the well.

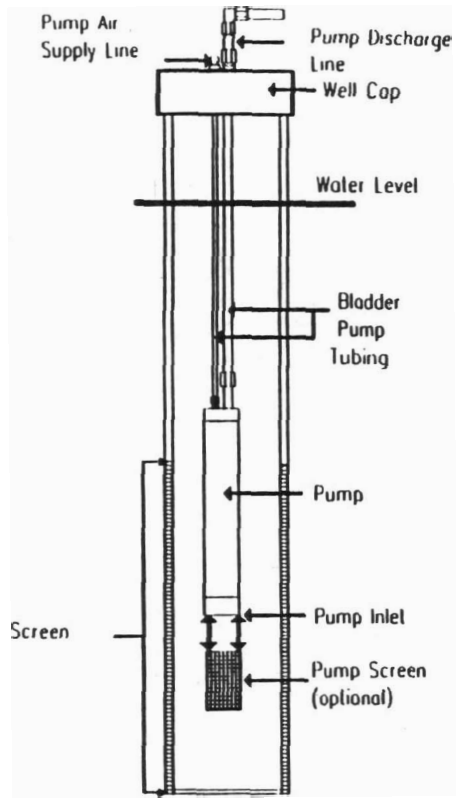


Figure 1-1: Well Wizard Pump Installed in a Well

As Figure 1-1 shows, you normally position the pump inlet midway in the screen section of the well, suspending it by two tubes that supply air to the pump and convey the water sample to the well cap. Whenever possible, pumps are shipped already preassembled to the tubing and the well cap assembly.

Several types of Well Wizard bladder pumps are available.

1100 Series Pumps

The 1100 series pumps include four major components:

- *Upper-end check valve assembly (polyvinyl chloride (PVC) or Teflon™),*
- *Lower-end check valve assembly (PVC or Teflon).*
- *Bladder cartridge (Teflon).*
- *Pump body (PVC or Teflon).*

You can totally disassemble this pump without tools by unscrewing each end cap and pushing the bladder cartridge out of the pump body (for more information, refer to the instructions included with the field-replaceable bladder kit). The weep hole on the water-discharge fitting aids cold-weather operation by allowing the water discharge line to drain after use.

1200 Series Pumps

The 1200 series pumps include two major components:

- *Bladder cartridge assembly (either Teflon and stainless steel or PVC and stainless steel).*
- *Pump body (stainless steel).*

You can partially disassemble this pump (for more information, refer to the instructions included with the field-replaceable bladder kit). The pump body covers the weep hole on the upper portion of the bladder cartridge to aid cold-weather operation, so you may sometimes see water dribble from the pump body.

1500 Series Pumps

The 1500 series pumps are the same as the 1200 series Well Wizard pumps except that they are much longer. They're available in stainless steel with PVC or stainless steel with Teflon. Also known as *Power Pumps*, these pumps save you from needing both a purge pump and a sampling pump in deep wells with moderate purge volumes, by delivering higher flow rates.

How Bladder Pumps Work

The bladder pump has two alternating cycles (refer to Figure 1-2):

- **During the discharge cycle,** air forced into the space between the pump body and the pump bladder squeezes the water inside the bladder into the exit/entrance holes of the fill rod. As air pressure increases, liquid–having no place else to go–is forced up the discharge line and to the surface. The bottom check ball is forced down by the air pressure in the pump; this seals the inlet so that no water can enter the bladder chamber.
- **During the refill cycle,** with no air pressure holding it down, the water pressure pushes the bottom check ball up, allowing the water to reenter the bladder chamber. The bladder expands as it refills with water. The top check ball seals because of the force of the water pressure in the discharge tubing.

Caution: Although you can operate a Well Wizard pump *dry* without damaging it, the bladder can be punctured if you pump sand. So be sure to use an inlet screen in wells with high sand and sediment content, or when the inlet of the pump is placed within 2 feet of the bottom of the well. Remember, the Well Wizard 10-year warranty is void if you don't use an inlet screen.

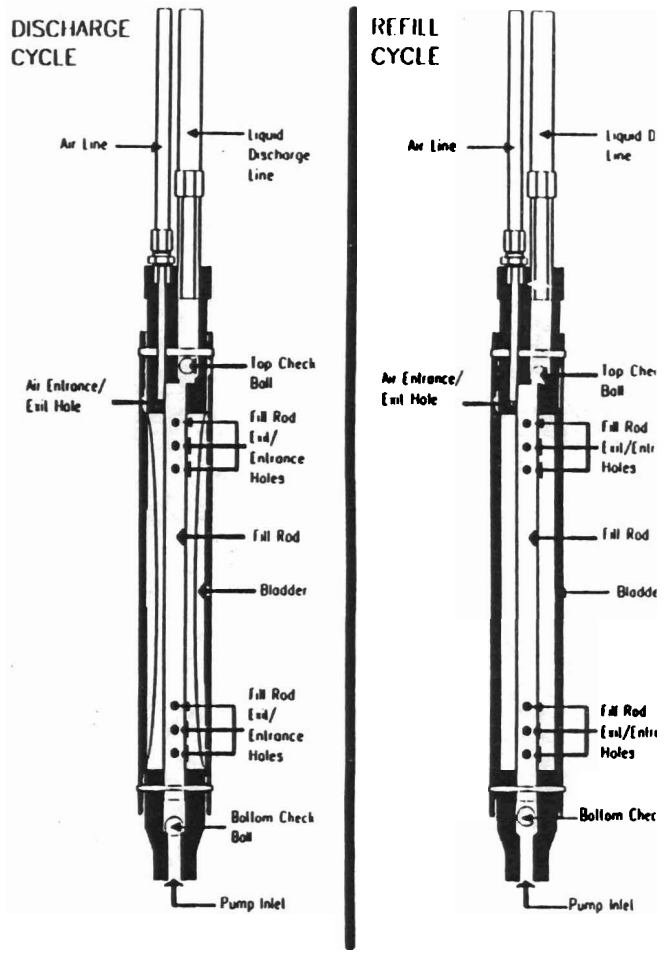


Figure 1-2: Bladder Pump Cycles

Pump Tubing

A ground water sample is only as good as the tubing it runs through. Your Well Wizard was shipped with one of the following types of superior-quality tubing:

- Polyethylene.
- Teflon-lined polyethylene.
- Teflon.

Most tubing is supplied as a bonded pair (air supply and discharge), to save time and avoid tube entanglement.

Unless your order specified that you wanted *bulk* tubing, the tubing for your Well Wizard bladder pump is pre-cut to the correct length for your well. If you also have a Purge Mizer, you'll need to fit and trim its tubing; if you have a Purge Master, that tubing is pre-cut but not connected to the pump or cap. Instructions for these procedures are in Chapter 2, "Installing the Components."

Inlet Screen

An inlet screen can protect the bladder in your Well Wizard pump by preventing sand from contacting the bladder. If you install a screen on your dedicated Well Wizard bladder pump, QED warrantees the pump for a full 10 years.

Well Cap

You fit a well cap to the top of the well casing to suspend the pump and tubing. There are two terminal fittings inside the basic well cap (see Figure 1-3):

- A compression *through fitting* for the discharge line.

- A short brass *quick-connect nipple* for the pump air-supply line.

The *protected* well cap has a lid with a lock pin. You can record well identification and reference date information on the cap label. The *unprotected* well cap is meant for wells located within a user-supplied protected standpipe.

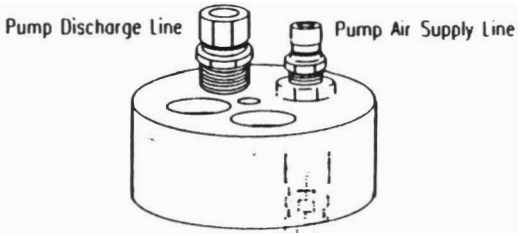


Figure 1-3: Well Cap

Pneumatic Static Water-Level Probe

You can permanently mount an *optional* static water-level probe inside the well. Then you can use a portable instrument to pneumatically measure the submergence of the probe.

Packer & Purge Pump

In conjunction with dedicated Well Wizard sampling pumps, you can install an *optional* packer (Purge Mizer) or purge pump (Purge Master) to shorten well purge times in any size well over 2 inches in diameter.

- A Purge Mizer packer inflates to seal off the sampling zone from the remainder of the water column. A *tandem* Purge Mizer combined with a standard Purge Mizer and a sampling pump lets you seal off both *above* and *below* the sampling zone.

- **A Purge Master** purge pump saves purge time in wells that contain a large volume of water to be purged before ground water sampling. This pump operates on a gas-displacement principal that results in high flow rates. However, because drive air contacts the well water, you don't also use this pump for sampling–you use the Well Wizard bladder pump instead.

Portable Components

Portable Well Wizard components include a cycle controller, water-level meter, disposable sample filters, and a flow-through cell.

Cycle Controller

A cycle controller controls operation of the Well Wizard pump by regulating the air flow from a compressed-gas source to the pump. Figure 1-4 shows the control panel from a typical Well Wizard cycle controller. Several controllers are available.

Model 3013 Automatic Controller

When connected to an appropriate compressed-gas source, the Model 3013 Automatic Controller alternately pressurizes then vents the air-supply line to the pump, allowing the pump to discharge, then fill with water. Using two timers, you can separately adjust the duration of the discharge pumping and venting cycles to maximize the pumping rate. The timers have a range of a fraction of 1 second to 2 minutes. A separate control lets you reduce the flow rate for sample collection.

Because this controller is pneumatically operated, it requires no electrical power supply. QED recommends that the compressed-gas sources be of high quality, such as breathing air or air from an oil-less compressor like the one offered in the Well Wizard product line.

WARNING! Do not apply pressure greater than 120 psi to the standard controller. Higher pressures may create hazardous conditions and will void your Well Wizard system warranties. However, higher air-flow-rate and higher pressure versions are available.

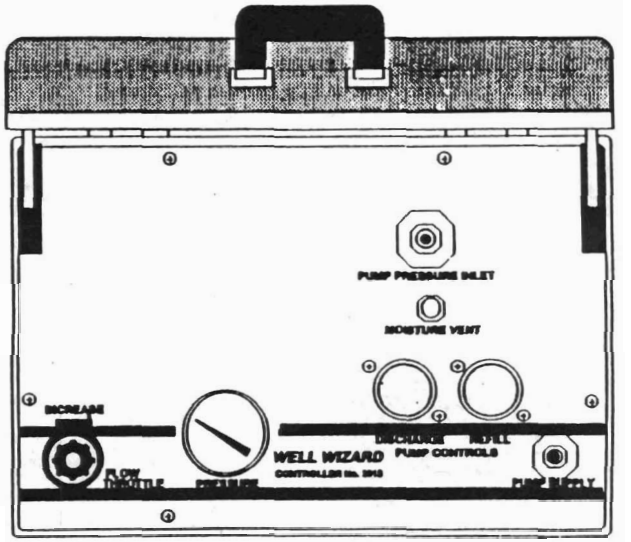


Figure 1-4: Typical Well Wizard Cycle Controller Control Panel

Model 3111 Automatic Controller/Compressor

The Model 3111 Automatic Controller/Compressor is a self-contained, cart-mounted unit that combines a compressor with a 3013 Automatic Controller. Its air-cooled gasoline engine drives a 100 psi oil-less compressor. This is a convenient, easily transportable compressed-air source.

WARNING! Do not apply pressure greater than 120 psi to the controller. Higher pressures may create hazardous conditions and will void your Well Wizard system warranties. However, higher air-flow-rate and higher pressure versions are available.

Model 350 Electronic Controller

Because the Model 350 Electronic Controller is electronic, it's also lightweight. Beyond that, this controller works essentially the same as the 3013 Automatic Controller, except that its timers have a narrower range.

Water-Level Meter

QED offers two approaches to portable static water-level measurement:

- **The pneumatic water-level approach** uses a portable battery-operated meter to measure the submergence of the dedicated probe. You calibrate the meter when you install it, and periodically after that. Batteries and a refillable compressed-gas charge from the pump controller output power the meter.
- **The electronic water-level approach** uses a portable conductivity probe attached to a calibrated tape. A light shines and a buzzer sounds when the probe touches the water surface. You lower this probe into each successive well.

Flow-Through Cell

Purge Saver is QED's *optional* flow-through cell. It simultaneously uses four probes to measure the pH balance, conductivity, temperature, and dissolved oxygen content of purge water. Purge Saver lets you know when it's okay to sample—generally saving you from spending a lot of time and from removing large volumes of water. If you have Purge Saver, for information about how to operate and maintain it, refer to the separate Purge Saver documentation.

QuickFilter

To ensure accurate samples of dissolved metals, you can use an *optional* QED QuickFilter. It removes solids larger than 0.45 micron. Because QuickFilters are disposable—you use one for each sampling event—there's no need to try to clean or decontaminate the filter from well to well.

2

INSTALLING THE COMPONENTS

If you've received a set of preassembled dedicated components, you'll find that unpacking them and installing them is easy when you follow the instructions in this chapter. Because not everyone needs to read the whole chapter, the first section helps you decide which of the other sections you need to read.

If, instead of preassembled components, you've received unassembled components and bulk tubing, read Chapter 5, "Installing a Pump Using Bulk Tubing."

Before You Begin...

How many of the installation procedures in this chapter you need to follow depends entirely on which components you have. But *everyone* needs to refer to these sections:

- "Unpack the Components."
- "Install the Basic Sampling Pump."

To find out which of the other sections to read, take stock of what you have by referring to the stapled sheets titled "Downwell Equipment Build/Specifications Sheet(s)." These sheets—and any other instructions—are inside a box labelled "Instructions Enclosed," which is inside Box 1.

When you know what you have, refer to Table 2-1 to find out which sections of this chapter you need to read to install your specific set of components—and in what order:

Table 2-1: What to Read & In What Order

If you have	Read this	In this sequence
A sampling pump	"Unpack the Components"	First
Inlet screen	"Install the Inlet Screen"	*After* unpacking the components
Packer (Purge Mizer)	"Install an Optional Packer–Purge Mizer"	*Before* installing the basic pump
Purge pump (Purge Master)	"Install an Optional Packer–Purge Pump"	*Before* or *after* installing the basic sampling pump–refer to the "Downwell Equipment Build/Specifications Sheet(s)"
Water-level meter	"Install an Optional Water-Level Meter Probe"	*After* installing the basic pump and any packer or purge pump

Unpack the Components

Here's how to unpack the Well Wizard dedicated components.

1. If you need to install a Well Wizard system in more than one well, decide which well you want to do first. Then find the box of components with the correct well-identification number written on the outside of the box.

2. If you *don't* have a Purge Mizer, skip to Step 3; if you *do* have a Purge Mizer, get the following tools ready:
   - 2 8" adjustable crescent wrenches.
   - 2 12" adjustable crescent wrenches.
   - 1 Tubing cutter (supplied by QED).
3. Carry the box to the well site, then open the box, but don't touch anything yet.
4. Open the box, *then, before unpacking the rest of the box*, put on a pair of the latex gloves you find inside the box.

> **Caution:** Touching well components with your bare hands can contaminate the components and degrade the quality of the samples obtained using the Well Wizard system. Always wear clean latex gloves when unpacking and installing a Well Wizard system, and at any other time when your hands might touch a water-contacting component.

5. Taking care to *not kink the tubing*, gently remove the plastic-wrapped pump and tubing from the box. A label on the package provides the well ID, cap, and tubing length. You may need this information later, so save the label.

> **Note:** The plastic bag also contains the lab-clean certificate on which is recorded the pump batch serial number. Keep this tag *for each pump* you install. It's your proof that the pump is contaminant free–if you need to, you can call QED with the serial number to find out which lab certified the pump.

6. Open the plastic wrapping, then gently slide the pump out of the bag.

Install the Inlet Screen

Well Wizard bladder pumps have a 10-year warranty that is valid *only* if you use the appropriate inlet screen.

There are two types of inlet screen: one that you *thread* onto the pump inlet for 1100 series pumps, and one that you secure with *set screws* for 1200, 1300, and 1500 series pumps. The correct screen for each pump is usually included with the other components for the well–the box label tells you where to find the screen. The following sections describe how to install the two types of inlet screen.

Screens for 1100 Series Pumps

To install a screen on an 1100 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove the screen.
2. Thread the screen onto the male-threaded pump inlet, making sure the screen is firmly tight.

Screens for 1200, 1300, & 1500 Series Pumps

To install a screen on a 1200, 1300, or 1500 series pump, follow these steps:

1. Still wearing the latex gloves, open the plastic wrapping, then remove from the bag both the screen and the small plastic bag that contains spare set screws and a small Allen wrench.
2. Find the groove around the inlet end of the stainless steel pump body (the end opposite the air and water connectors), then slide the screen onto the bottom of the pump assembly, aligning the top rim of the screen with the top groove.

Note: If you have difficulty installing the screen, use the Allen wrench to loosen the set screws a little.

3. Using the Allen wrench, *lightly* tighten each of the set screws, then make sure the screws have engaged the groove.
4. Using the Allen wrench, *firmly* tighten each of the set screws
5. Check to make sure the screen is secure.

Install an Optional Packer–Purge Mizer

If you have a Well Wizard sampling system with Purge Mizer, it was shipped with the Purge Mizer *support cable* and *three tubing connections* loose at the cap, to allow you to adjust the length of the various tubes to exactly fit your well. To finish installing these, complete the steps in the following sections before completing the steps in "Install the Basic Sampling Pump," later in this chapter. As a guideline, at the end of Purge Mizer installation, you want to have the Purge Mizer cable *taut* and the tubing just slightly *slack*–so the cable bears the weight of the pump. Note that there are always several inches of inflation tubing left that must later be trimmed, but still left slack, to avoid kinking.

Note: If you don't understand how to use the compression style fittings described in the following sections, refer to the instructions in "Install or Replace Pump Connectors" in Chapter 6, "Maintaining Your Well Wizard System."

Attach the Purge Mizer Cable to the Well Cap

How you attach the Purge Mizer support cable to the well cap depends on whether you have a standard cap or a 2120A 2-inch cap. The following sections describe both procedures

Standard Cap

If you have a Purge Mizer and a standard cap (with support bar), follow these steps to attach the support cable to the cap.

1 Push the threaded terminal through the cap far enough that the support bar can spin freely on it.
2 Spin the bar down to the bottom threads of the terminal.
3 Lower the bar onto the cap, between the cap fittings.

The result should resemble Figure 2-1.

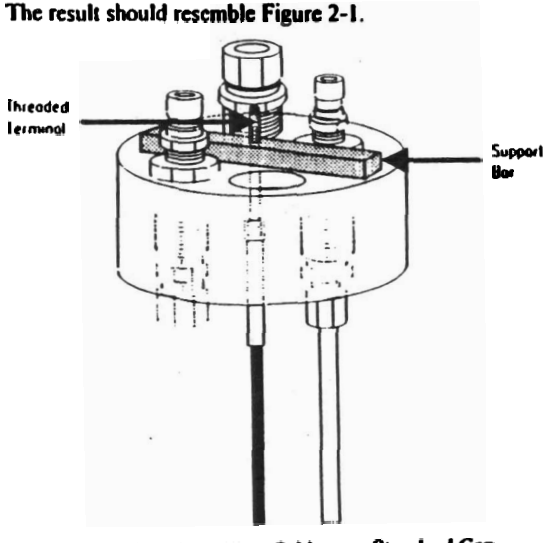


Figure 2-1: Installing Cable on a Standard Cap

2120A 2-Inch Cap

If you have a Purge Mizer and a 2120A 2-inch cap, follow these steps to attach the Purge Mizer support cable to the cap

1 With the support bracket between the sides of the strap fork, slide the clevis pin through the holes
2 Slide the cotter pin through the clevis pin
3. Secure the cotter pin by bending the ends

The result should resemble Figure 2-2

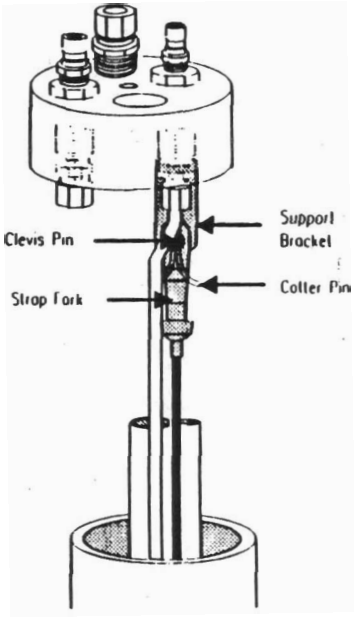


Figure 2-2: Installing Cable on a 2120A 2-Inch Cap

Install the Discharge Tubing

To install the discharge tubing, follow these steps.

1. Pull or push the 1/2-inch discharge tubing through its fitting, adjusting it until it's slightly *less* taut than the Purge Mizer support cable–leaving about *1-1/2 feet* extending above the well cap.

   Caution: For now, don't cut off the approximately 1-1/2 feet of excess tubing that extends above the well cap. Wait until Step 3 in "Install the Well Cap," later.

2. With a wrench, hold the base of the through fitting and, with another wrench, tighten the fitting nut until firm.

Install the Inflation Tubing

To install the Purge Mizer inflation tubing, follow these steps.

1. Determine the length of 1/8-inch Purge Mizer inflation tubing needed to extend completely into the compression style fitting on the underside of the cap or cap plate while leaving the tubing *less* taut than the Purge Mizer support cable.

   Caution: Measure with care. It's better to leave a little extra tubing prior to cutting than to cut off too much.

2. Use the tubing cutter to cut off the excess tubing.
3. Push the tubing fully into the fitting until it contacts the shoulder inside the fitting.
4. On the top of the cap or cap plate, with a wrench, hold the brass anchor fitting in which the 1/8-inch Purge Mizer inflation tube fitting is installed.
5. Tighten the tubing fitting with the wrench until it's firm.

6. Turn the tubing fitting about three-quarters of a turn past *hand tight*—but don't tighten it enough to crush the Purge Mizer tubing.

Install the Air-Supply Tubing

To install the air-supply tubing, follow these steps.

1. Determine the length of 1/4-inch air-supply tubing needed to extend completely into the brass 1/4-inch compression fitting on the underside of the cap or cap plate while leaving the tubing *less* taut than the Purge Mizer support cable.

   Caution: Measure with care. It's better to leave a little extra tubing prior to cutting than to cut off too much.

2. Use the tubing cutter to cut off the excess tubing.
3. Push the tubing into the fitting until it contacts the shoulder inside the fitting.
4. On the top of the cap or cap plate, with a wrench, hold the brass anchor fitting in which the 1/4-inch air-supply tubing is installed.
5. Tighten the tubing fitting with another wrench until it's hand tight.
6. Turn the tubing fitting one and one-quarter turns *past* hand tight.



Install the Basic Sampling Pump

Depending on the length of the tubing and whether your pump includes a Purge Mizer or a Purge Master, it may be easiest for two people to install the pump–but one person often can do it. To install the pump, follow these steps.

Caution: Make sure that you don' bring the tubing or other pump components in contact with the ground or any other surface. It's often helpful to spread out a polypropylene tarp next to the well during installation.

1. Still wearing the latex gloves, if you have a protected well cap, mark any necessary information–such as well ID and depth–on the label inside the well cap.
2. Slowly lower the pump into the well while uncoiling the tubing bundle, until the entire length of tubing is in the well.

   Note: If you don't have a Purge Mizer, skip Step 3.

3. What you do in this step depends on which components you have:
   - **If you have just the basic sampling pump,** either anchor the well cap in position or leave it loosely attached.
   - **If you have a *Purge Mizer*,** lower the cap on the well. Then, leaving 1 inch or a little more, cut off the remaining tubing (about 1-1/2 feet) and attach it to the sample elbow. You can store the elbow and tubing in one of the unused holes in the cap plate.
   - **If you have a *Purge Master that you haven't yet installed*,** proceed with the instructions in "Install an Optional Purge Pump–Purge Master."

Install an Optional Purge Pump–Purge Master

If you have a Well Wizard sampling system with Purge Master, although the tubing is cut to the correct length for your well, you need to install the tubing when you install the pump. Refer to the "Downwell Equipment Build/ Specifications Sheet(s)" to see whether to install your sampling pump or your purge pump first.

The following sections tell you how to install Purge Master

Attach the Tubing Bundle to the Pump

Follow these steps to install the Purge Master tubing bundle.

1. Get the following tools ready:
   - 2 **12"/300 mm adjustable** crescent wrenches
   - 1 Tubing cutter (supplied by QED)
2. Make sure that both the 3/4-inch and the 1/2-inch fitting nuts on the top of the pump are loose.
3. Holding one end of the tubing bundle, press a 1/2-inch and a 3/4-inch tubing insert into the corresponding tubing.
4. Loosening the nuts as necessary, push the tubing into the 3/4-inch and 1/2-inch fittings on the top of the pump, as follows:
   - **Push the larger tubing into the 3/4-inch fitting until it contacts the shoulder inside the fitting.**
   - **Push the smaller tubing into the 1/2-inch fitting until it contacts the shoulder inside the fitting.**
5. With a wrench, tighten the 3/4-inch fitting nut hand tight.
6. With a wrench, hold the fitting base, then turn the 3/4-inch fitting nut one additional turn *past* hand tight.

7. With a wrench, tighten the 1/2-inch fitting nut hand tight.
8. With a wrench, hold the fitting base, then turn the 1/2-inch fitting nut one additional turn *past* hand tight.

Lower Purge Master into the Well

To lower the Purge Master into the well, follow these steps.

1. Lift the cap plate or unprotected cap out of the well and let it hang off to one side.
2. Lower the pump into the well slowly while uncoiling the tubing bundle–until there's about 3 feet of tubing left.

Attach the Discharge Tubing to the Well Cap

To attach the discharge tubing to the well cap, follow these steps.

1. With the large fitting nut on the *top* of the cap plate or unprotected cap loose, push the discharge tubing through its fitting–leaving about 1-1/2 feet extending above the cap.

> **Caution:** For now, don't cut off the approximately 1-1/2 feet of excess tubing that extends above the fitting. Wait until Step 3 in "Install the Well Cap," later.

2. If you have a cap that has a fitting nut on the underside, with a wrench, tighten the fitting nut on the underside hand tight
3. With a wrench, hold the fitting base.
4. Turn the fitting nut one additional turn *past* hand tight.

Attach the Air-Supply Tubing to the Well Cap

To attach the air-supply tubing to the well cap, follow these steps.

1. Loosen the 1/2-inch fitting nut on the top of the cap or cap plate.
2. Referring to Figure 2-3, estimate where to cut the air-supply tubing so that it contacts the shoulder inside the 1/4-inch air fitting on the underside of the cap or plate—leaving a little bit of slack (the 3/4-inch tubing should provide the main support for the pump).

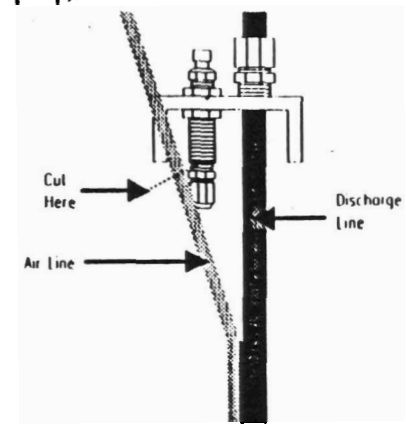


Figure 2-3: Where to Cut the Tubing

3. Cut the air-supply tubing according to your calculation in Step 2.
4. Push the air-supply tubing into the fitting until it contacts the shoulder inside the fitting.
5. With a wrench, tighten the fitting nut hand tight.
6. With a wrench, hold the fitting base.
7. Turn the fitting nut one additional turn *past* hand tight

Install the Well Cap

To install the well cap, follow these steps

1. If you want to prevent debris (such as rust from the protective casing) from getting on the well cap and into the well, fit a plastic bag over the well cap.
2. Lower the cap or cap plate on the well.
3. Making sure that you allow room to install the discharge elbow so that the elbow clears the top edge of any unprotected cap or protective casing, trim off the excess 1-1/2 feet of discharge tubing using the tubing cutter.
4. Store the sample elbow and tubing in the spare hole in the cap, if you want to.

Install the Optional Water-Level Meter Probes

If your Well Wizard system includes the Model 6010E Electronic/Pneumatic Water-Level meter, the following steps describe how to install the probe. Refer to Figure 2-4 as you follow the steps.

Caution: Ensure that the static water level in the well has returned to its natural level after any recent purging or sampling or displacement due to equipment installation. In wells that recover very slowly, water displacement during new-equipment installation may temporarily alter the true static water level of the well.

1. Measure the current static water level in the well (C in Figure 2-4), then record it using your traditional method.

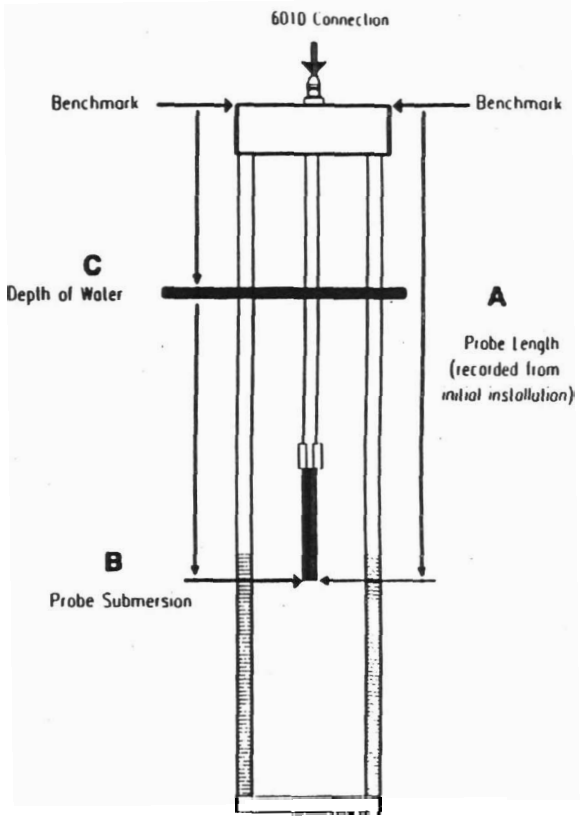


Figure 2-4: Measurements for Probe Installation

2. Review the historic static water-level fluctuations to determine whether the current reading reflects a good starting point for water-level probe location. Ideally, the probe should be submerged about 10 to 12 feet below the *mean static level*.
3. Decide where you want to locate the water-level probe.

> **Caution:** Although 10 to 12 feet below the mean static level is an *ideal* submergence for the probe, you *must* submerge the probe at least 1 foot but not more than 25 feet, because the meter can't display depths outside this range.

4. Measure and cut the 1/4-inch probe tubing to the length you calculated.
5. Attach the tubing to the probe assembly, then, to avoid an air leak and false readings, tighten it carefully using two wrenches.
6. Lift up the cap or plate, then lower the probe and tubing into the well.
7. Attach the probe tubing to the 1/4-inch compression fitting under the cap or plate, then tighten it using two wrenches.
8. Lower the cap or plate back into position on the well casing.
9. Determine the probe submergence. To find out how to do that, refer to Chapter 3, "Purging the Well," and read the section about measuring the water level with a dedicated water-level meter.
10. Add the static water level depth you measured in Step 1 to the submergence reading you determined in Step 9 (A in the drawing), to determine the probe location.
11. Record the probe length (A) and the measured calibration static water level determined in Step 1, for use in all future water-level depth calculations.
12. Apply the new probe submergence readings to the calibration to determine the new static water level.

3

PURGING THE WELL

Before sampling, you need to purge the well according to your approved sampling plan. This chapter tells you how to:

- Measure the water level using either a dedicated or a portable water-level meter.
- Purge the well using:
  - Just the sampling pump.
  - The sampling pump *and* Purge Mizer (packer).
  - Just Purge Master (purge pump).
- Maximize the pumping rate for both a sampling pump and Purge Master.

Measure the Water Level

Before you purge the well, you normally check the static water level. You can do that with either a dedicated or a portable water-level meter, as described in the following sections.

With a Dedicated Water-Level Meter

If you have a Model 6010E Electronic/Pneumatic Water-Level meter, to measure the water level, first you charge the air tank, then you use the water-level meter to measure the water level. The following sections tell you how.

Note: Rapid temperature changes adversely affect water-level meter operation. The best approach is to store the meter at the temperature in which you will use it. If this isn't possible, move the unit to the appropriate temperature at least 45 minutes before you want to use it to allow the temperature to stabilize. Then you can expect the accuracy to be as follows:

- 40 to 120° F ambient air temperatures: +/-0.01 feet.
- -20 to 40° F ambient air temperatures: +/-0.02 feet.

Charge the Tank

1. As shown in Figure 3-1, attach the black driver-controller hose to the controller.
2. As also shown in the figure, attach the red air-supply line from the **PUMP SUPPLY** connector on the controller to the **TANK RECHARGE** fitting, to charge the internal air tank to 100 psi.
3. Set the controller **DISCHARGE** timer for the maximum discharge time (**F** on the Model 3013 and **5 O'CLOCK** on the Model 350).
4. Set the **REFILL** timer for the minimum refill time (**A** on the Model 3013 and about **9 O'CLOCK** for the Model 350).
5. Start the compressed-air source.
6. Let the controller cycle until the 6010E pressure gage reads 80 to 100 psi.

Caution: Do not apply pressure greater than 120 psi to the controller. Higher pressures may create hazardous conditions and will void your Well Wizard system warranties.

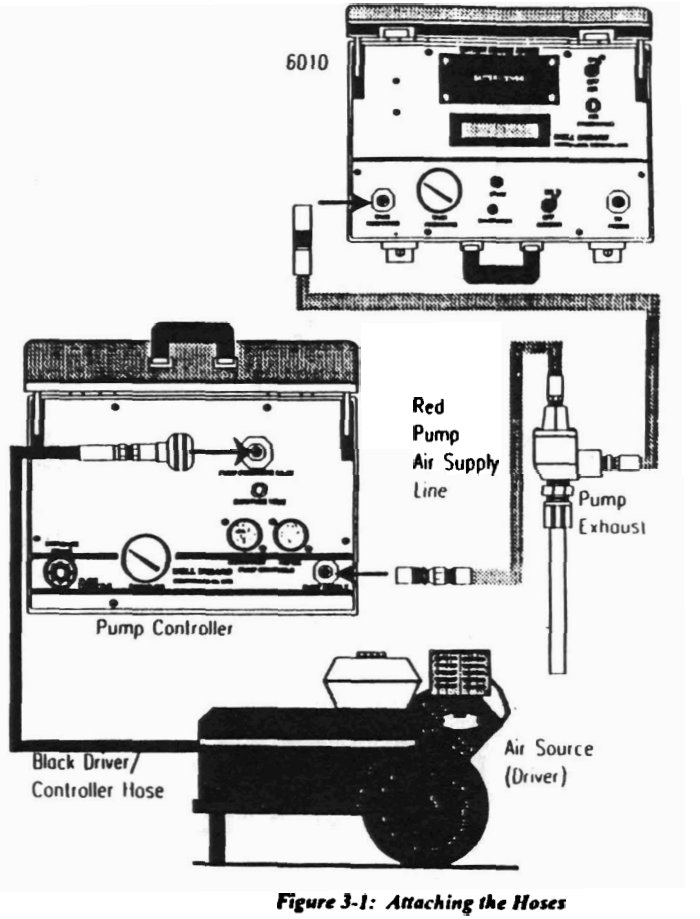


Figure 3-1: Attaching the Hoses

Operate the Meter to Measure Water Levels

1. Set the SENSOR switch to ON.
2. When the message reads **Attach to Well**, attach the clear air tubing from the TO PROBE fitting to the mating well cap connection.
3. Set the AIR switch to ON.
4. Press START once.
5. Press AIR PRE-CHARGE until the display shows the highest reading–you see the numbers increase, then stabilize at the highest reading.
6. Wait for the message to read **Probe Submersion Depth** (this is "B" in the diagram on the face of the meter), then record the reading when the depth stabilizes.
7. Move the AIR and the SENSOR switches to OFF.
8. Subtract the reading for Probe Submersion Depth ("B" in the diagram on the meter) from the known Probe Submergence ("A" in the diagram on the meter), established during probe installation (read about installing an optional water-level meter probe in Chapter 2, "Installing the Components"). The result is the depth of the static water-level probe.

With a Portable Water-Level Meter

If you have a portable water-level meter, follow these steps to measure the water level.

1. Still wearing the latex gloves, remove the black 1/2-inch square-head hole plug from the well cap.

   Note: If you don't see the black square-head screw, the sample tube may be stored in the opening. If so, remove it instead.

2. Insert the probe of the water-level meter through the opening, then unreel the probe tape into the well.

3. When the light shines and the buzzer sounds, the probe has contacted water. Write down or remember the depth to the static water level by reading the length shown on the tape, so you can refer to it when you're purging the well.
4. Remove the probe from the well, then replace the black square-head screw (or the sample tube and elbow).

Purge Using the Sampling Pump

To purge the well using just a Well Wizard sampling pump, you can follow either the general procedure described in the next section, *or* the steps in the more-detailed sections that follow.

Note: If you have a Purge Mizer (packer) as well as a sampling pump, follow the steps in "Purge Using Purge Mizer (packer)," before proceeding with these steps. If you have a Purge Master (purge pump), follow the steps in "Purge Using Purge Master (purge pump);" you don't need the steps in this section.

General Procedure for Purging

Here are the general steps to follow for purging

1. Start the compressor.
2. Hook up the hoses.
3. Set both timers on C for the Model 3013 or about 9 O'CLOCK for the Model 350.
4. Turn the yellow FLOW THROTTLE control knob completely clockwise, to make sure the pressure is as high as it will go.

If Steps 1 through 4 don't give you enough information, you may want to follow the steps in the following section *instead*, because they provide much more detail.

Detailed Procedure for Purging

The following sections provide the detailed steps for purging.

Get Purging Started

1. Considering the depth and size (diameter) of the well, calculate the number of gallons to be purged to comply with your approved sampling plan.
2. Start the compressor engine.

   But don't connect the red air-supply line to the Well Wizard controller yet. Instead, follow Steps 3 and 4 carefully.

3. As shown in Figure 3-2, connect the short end of the red pump air-supply line to the pump connector on the well cap.
4. Connect the long end of the red pump air-supply line to the **PUMP SUPPLY** connector on the Well Wizard controller.
5. Point the pump discharge line away from you.
6. Set both timers on **C** on the Model 3013 or at about **9 O'CLOCK** on the Model 350.
7. Connect the black driver/controller hose to the **PUMP PRESSURE INLET** connector on the Well Wizard controller.

   You'll notice **loud hissing and honking sounds** as air releases through the side of the Well Wizard controller housing and as air releases through the exhaust valve. This is *normal*.

   Note: If the controller doesn't sound as though it is alternating between cycles (pressurizing then venting), shorten the cycle times by setting the **REFILL** and **DISCHARGE** timer knobs to **A** on the Model 3013 or at about **9 O'CLOCK** on the Model 350.

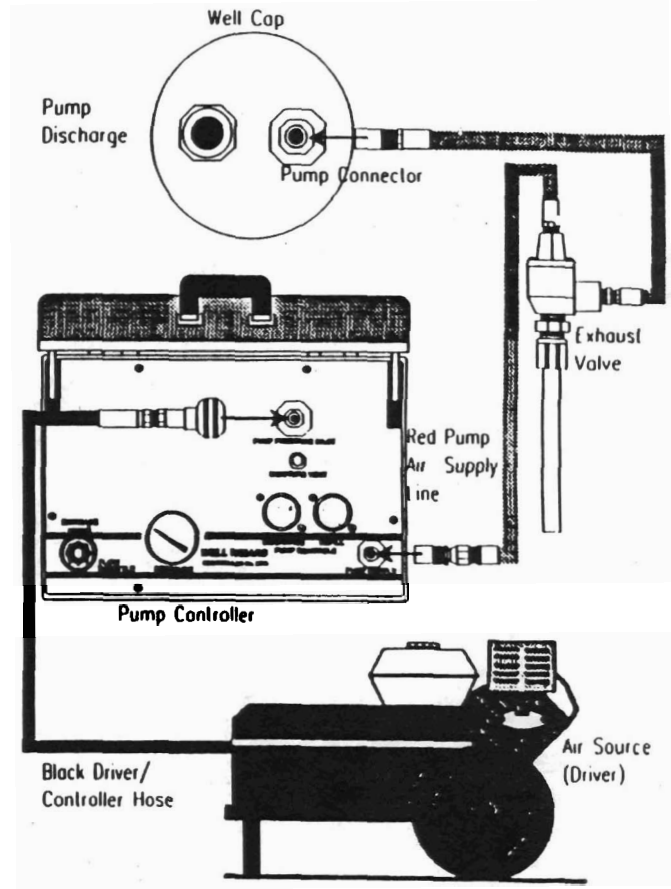


Figure 3-2: Connecting the Red Pump Air-Supply Line

After the venting noises stop, water flows from the pump discharge line as you begin to purge the well. The time required to actually begin discharge of water depends on the depth to the water–it may take several *seconds* or several *minutes*.

8. Check the air pressure on the **PRESSURE** gage on the Well Wizard controller. The pressure–which controls the flow rate–should be between 60 and 120 psi. If necessary, adjust the pressure using the **FLOW THROTTLE** control knob. Pull up on the yellow outer ring to unlock the throttle, adjust the setting, then push down to lock the throttle.

   Turning the **FLOW THROTTLE** knob clockwise increases pressure; turning it counterclockwise decreases pressure.

9. To make well purging as efficient as possible, refer to the steps in "Maximize the Pumping Rate," next.

10. Every 15 minutes, press down (and hold down for 5 seconds) the silver **MOISTURE VENT** button on the Well Wizard controller. This expels accumulated moisture from the side of the controller. It's especially important to vent the moisture during humid conditions and very cold conditions.

Maximize the Pumping Rate

Purging a well can be a time-consuming process. By adjusting the **REFILL** and **DISCHARGE** timers, you can make well purging as efficient as possible–so that as soon as the venting cycle ends, the pump is completely full and the discharge begins, and vice versa.

To do that, as detailed in the following steps, you first make both cycle times *long*, to ensure that the pump will completely fill then completely empty. Then you shorten one time until you see an effect on volume; then you shorten the second time the same way.

1. Lift the yellow outer ring of the **FLOW THROTTLE** control, turn the knob fully clockwise, then push down to lock the control.

2. Turn the **DISCHARGE** and the **REFILL** timer knobs to **D** on the Model 3013 or **12 O'CLOCK** for the Model 350–a *long cycle time*.

3. Using a 1,000 ml graduated cylinder for measuring (1,500 ml for Model 1500 pumps), measure the volume of water discharged in one cycle. This is the maximum pump volume–remember what it is.

   Note: For 1100 Series pumps, discharge volume should be 250 - 350 ml; for 1200 Series pumps it should be 350 - 450 ml. If your discharge volume is less than this, try increasing the refill cycle time. If that doesn't work, try shortening the refill cycle time, especially in deeper wells. (In deeper wells with very little water, if the cycle is too long, the water may actually have time to bleed through the weep hole before it can be discharged.)

4. To achieve as short a refill time as possible *without losing any refill volume*, slightly decrease the **REFILL** timer setting (turn the knob *counter*clockwise about half a setting). Then measure the volume of water discharged in the next three cycles. Repeat this step until you notice a decrease in discharge water volume.

5. Increase the **REFILL** timer setting (turn the knob *clock*wise) enough to regain full discharge volume. Refill is now set for maximum flow.

6. To achieve as short a discharge time as possible *without losing any discharge volume*, slightly decrease the **DISCHARGE** timer setting (turn the knob *counter*clockwise) Then measure the volume of water discharged in the next three cycles. Repeat this step until you notice a decrease in discharge water volume.

7. Increase the **DISCHARGE** timer setting (turn the knob *clock*wise) enough to regain full discharge volume. Discharge is now set for maximum flow.

Now you're purging efficiently.

Purge Using Purge Mizer (packer)

If you have a Purge Mizer, after you measure the water in the well, you inflate Purge Mizer, purge the well, then prepare for sampling.

Warning! ***Never*** **inflate Purge Mizer outside of the well. Inflate Purge Mizer** ***only*** **when positioned at full depth in the well casing. Always deflate Purge Mizer after use.**

To purge using Purge Mizer, follow these steps.

1. Couple the Purge Mizer control unit to the Purge Mizer air tubing fitting on the well cap (see Figure 3-3).
2. Couple the control unit to the short end of the red pump air-supply line connected to the Well Wizard controller.
3. Turn the **PRESSURE REGULATOR** knob fully counterclockwise.
4. Activate the compressed-gas source.

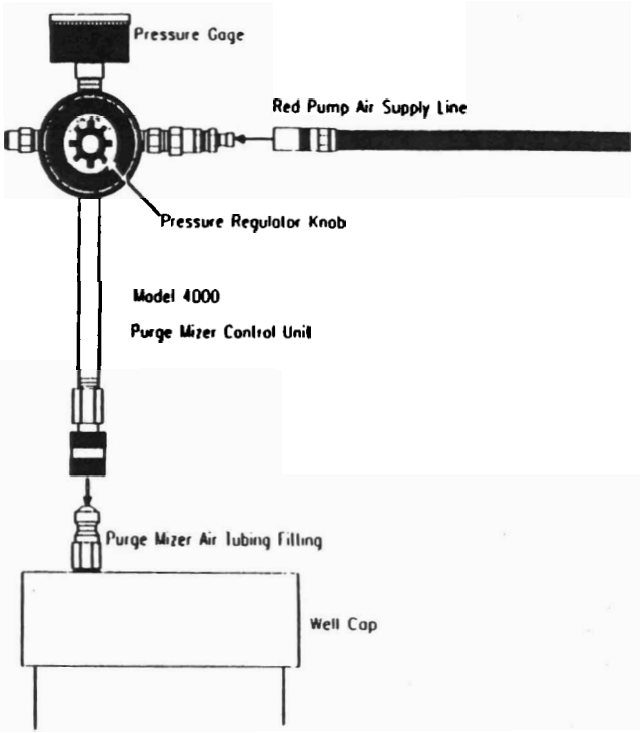


Figure 3-3: Coupling the Purge Mizer Control Unit

5 To fully inflate the Purge Mizer, slowly turn the **PRESSURE REGULATOR** knob on the Purge Mizer control unit clockwise to increase the pressure to the level recommended in Table 3-1.

Table 3-1: Recommended Pressure Levels

Purge Mizer Submergence (feet)	Inflation pressure (psi)
20	50
40	60
60	70
80	80
100	90

Note: The Purge Mizer inflates during the controller discharge cycle. To speed inflation, you can lengthen that cycle.

6. When you reach the correct pressure, disconnect the red air-supply hose. The Purge Mizer control unit check valve maintains the pressure.
7. Purge the well with the sampling pump as described in "Purge Using the Sampling Pump." If the pressure reading on the Purge Mizer control unit pressure gage remains steady, you know that Purge Mizer is operating correctly.

Purge Using Purge Master (purge pump)

If you have a Purge Master (purge pump), follow the steps in the following sections for high-rate purging.

Connect the Discharge Tubing Elbow

1. Connect the discharge tubing elbow to the 3/4-inch tubing protruding from the cap or cap plate.
2. Tighten the fitting nut with a wrench.
3. Direct the end of the tubing on the discharge elbow into the collection vessel.

Connect Purge Master

1. If you have a locking well cap, make sure the cap pin is engaged.
2. To achieve a short discharge cycle to start with, set the **DISCHARGE** timer knob at **A** on the Model 3013 or at about **9 O'CLOCK** on the Model 350.
3. Connect the short end of the red pump air-supply line to the quick-connect nipple on the cap or cap plate nearest to the white high-rate discharge fitting (see Figure 3-4).

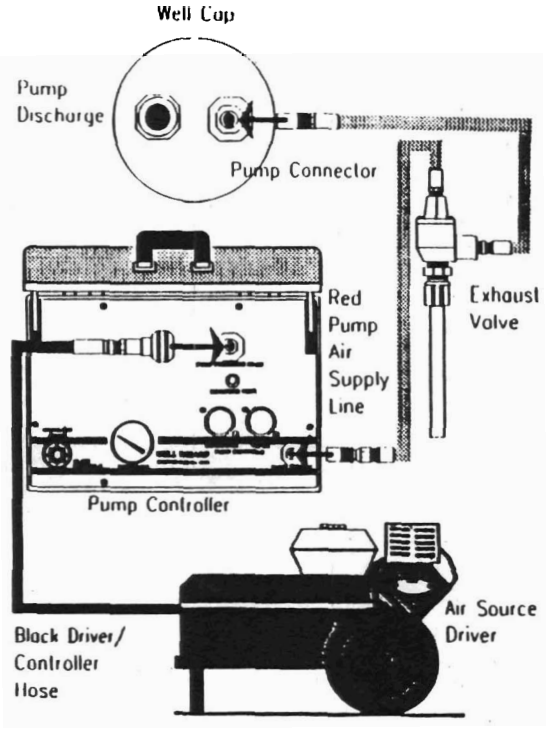


Figure 3-4: Connecting Purge Master

4. Connect the other end of the red pump air-supply line to the **PUMP SUPPLY** connector on the controller.
5. Not exceeding 125 psi, connect the black driver/controller hose to the **PUMP PRESSURE INLET** connector on the controller.

As purging begins, you'll notice loud hissing and honking sounds as air releases through the side of the Well Wizard controller housing and as air releases through the exhaust valve. This is *normal*. After the venting noises stop–from several seconds to several minutes–water flows from the pump discharge line as you begin to purge the well.

Note: If the controller doesn't sound as though it's alternating between cycles (pressurizing then venting), turn the **REFILL** and **DISCHARGE** timer knobs to shorten the cycles.

Set the Cycles

1. Use Tables 3-2 and 3-3 as guides to setting the **REFILL** and **DISCHARGE** timers, depending on the depth and submergence of the Purge Master in the well.

Table 3-2: Recommended Discharge Times

Pump Depth (ft.)	Discharge Time (sec.)
50	2.5
75	3.5
100	4.5

Table 3-3: Recommended Refill Times

Pump Depth (ft.)	Pump Submergence (ft)	Refill Time (sec.)
50	25	5.5
75	25	6.0
100	25	7.5
50	50	5.0
75	50	5.5
100	50	7.0

2. Turn the **FLOW THROTTLE** knob on the controller fully clockwise.

Maximize the Pumping Rate

Even with Purge Master, purging a well can be a time-consuming process. By adjusting the discharge and refill cycles, you can make well purging as efficient as possible.

1. With the pump operating, set the refill time *long* (about **11 O'CLOCK** for Model 350 or **C** for Model 3013 in most cases—a higher setting if the well is shallow).
2. Referring to Table 3-4, set the discharge time *short* (1 second for wells shallower than 50 feet; 3 seconds for wells 50 to 100 feet, and 5 seconds for wells deeper than 100 feet). Water should begin to flow through the discharge line after 5 to 15 pumping cycles, depending on the depth of the well.

Table 3-4: Approximate Settings Versus Times

Model 350 Setting	Seconds	Model 3013 Setting
7 o'clock	1	A
	3	B
8 o'clock	3.5	-
9 o'clock	7	-
	9	C
10 o'clock	13	
11 o'clock	16.5	
12 o'clock	19.5	
	20	D
1 o'clock	22.5	
2 o'clock	26.5	
	31	E
3 o'clock	32	
4 o'clock	35.5	
5 o'clock	37	
	42	F

3. Measure the liquid discharged during one cycle. The volume of the liquid is less than the internal volume capacity of the pump.
4. Increase the discharge time *gradually* (turning the knob less than a full setting), letting the pump go through its cycle three to five times after each adjustment.
5. Repeat Step 4 until you see air bubbles coming through the discharge line.
6. Decrease the discharge time slightly to eliminate the air bubbles. The amount discharged per cycle is now close to the internal volume capacity of the pump—the *discharge* cycle is maximized.

> **Note:** If air and water begin to shoot out *hard*, the discharge cycle time is too long. Set the discharge time short again, then repeat Step 4 using even smaller timer adjustments.

7. Decrease the refill time *gradually*, letting the pump cycle three to five times after each adjustment.
8. Repeat Step 6 until you see air bubbles coming through the discharge line.
9. Increase the refill time slightly to eliminate the bubbles. The amount of water discharged per cycle should still be close to the internal volume capacity of the pump—the *refill* cycle is maximized.

> **Note:** If air and water begin to shoot out *hard*, the refill cycle time is too short. Set the discharge time long again, then repeat Step 4 using very small timer adjustments.

Clear the Discharge Line

During the winter in northern climates, to prevent the discharge tubing of your Purge Master from *freezing*, you need to clear the discharge line of standing water above the static water level.

1. Before disconnecting the air supply from Purge Master, set the discharge cycle time on the controller long enough to cause air to exit from the Purge Master discharge line.
2. Wait until all the water is blown out of the discharge tubing.

4

COLLECTING A SAMPLE

After you've purged the well, you're ready to sample. A slow flow rate is recommended in most sampling protocols. When you *slow* the flow from the pump, you also avoid spurts, sprays, and drips.

The following sections tell you how to adjust the rate of flow for sampling and how to collect the sample.

Adjust the Rate of Flow

When you collect a sample, you want a smooth, non-aerated flow. To get that kind of flow, follow these steps.

1. Turn the **FLOW THROTTLE** knob on the controller *counter-*clockwise to slow the flow.
2. If you want to use a QuickFilter to filter your sample, disconnect the air supply on the controller to stop the pump, attach the QuickFilter to the tubing following the instructions on the box, then re-connect the air-supply on the controller to re-start the pump.

Caution: To avoid housing or membrane failure and sample contamination, make sure the pressure does not exceed 60 psi.

3. If you purged the well using a Purge Master purge pump, reconnect the red pump air-supply line to the sampling pump, then make sure that you purge 1/2 to 1 gallon of water through the sampling pump. This ensures that you sample fresh well water.
4. Turn the **DISCHARGE** timer knob to **D** for the Model 3013 or to **12 o'clock** for the Model 350, to lengthen the cycle (because it will take longer to get the full volume of the pump at the slower flow).
5. Continue adjusting the **FLOW THROTTLE** knob until the flow is completely smooth.

Collect the Sample

To collect the sample, follow these steps.

1. If you're using a QuickFilter, discard the initial volume of filtered sample (500 ml for Model FF8100; 1,000 ml for Model FF8200).
2. Direct the flow into the sample vessel.
3. Turn off the driver engine, then disconnect the hoses from the well cap.
4. If you have a Purge Mizer, turn down the regulator to relieve the pressure, then remove the Purge Mizer control unit. The Purge Mizer deflates automatically.

5

INSTALLING A PUMP USING BULK TUBING

This chapter is for you if you ordered your Well Wizard components and tubing unassembled. The following sections tell you how to assemble the components and tubing.

Get Ready

It's important to not contaminate pump components. Doing so can degrade the quality of the samples obtained using your Well Wizard system. Always wear latex gloves when unpacking and installing Well Wizard components, and at any other time when your hands might touch a water-contacting component.

Cut Tubing to Length

To cut the tubing to the correct lengths, follow these steps.

1. Attach the bulk tubing to the pump.
2. Lower the pump into the well until the pump touches the bottom of the well.
3. Raise the pump up, as follows:
   - 1 foot, for low-recovery wells.
   - To the middle of the screen, for high-recovery wells.

3. With a wrench, hold the anchor nut on the top of the well cap, then tighten the nut one turn past finger tight.

Fittings

To make final adjustments and tighten the tubing in its fittings, follow these steps.

1. Push the discharge and air-supply tubing though the well cap panel slightly–as necessary to provide final, even alignment of the tubing.
2. Tighten the discharge tubing nut one full turn past finger tight.
3. Tighten the air-supply tubing nut one full turn past finger tight.

Install the Optional Components

The following sections provide information to help you as you install optional Well Wizard components.

Inlet Screen

If you want to install an inlet screen on your sampling pump (the Well Wizard 10-year warranty is *void* without it), follow the instructions in Chapter 2, "Installing the Components."

Purge Mizer

If you're installing a Purge Mizer along with your sampling pump, remember that you must install Purge Mizer before you install the pump. You need to position it above the *top of the well screen*, rather than in the screen section of the well. Refer to the installation instructions included with Purge Mizer and, if

necessary, to the instructions in Chapter 2 of this book, "Installing the Components."

Purge Master

Refer to the installation instructions included with Purge Master and, if necessary, to the instructions in Chapter 2 of this book, "Installing the Components."

Install the Pump

To install the assembled pump, follow these steps.

1. If you have a protected well cap, attach the well cap base to the well casing; otherwise, skip to Step 2.
2. Lower the sample pump down the well.
3. If you want to prevent debris (such as rust from the protective casing) from getting on the well cap and into the well, fit a plastic bag over the well cap.
4. Close the well cap.

4. Estimate where to cut the tubing so that the air-supply (smaller) tubing terminates at the proper position below the cap.
5. Cut both tubes at about 1 to 1-1/2 feet longer than the length you estimated in Step 4.
6. Separate the tubing 1 to 2 feet, then cut the air-supply (smaller) tubing at the length you estimated in Step 4.

> **Caution:** Don't pull the tubing apart *sideways*–it may *tear*. Instead, hold the larger tube stationary with one hand. Then, with the smaller tube in the other hand, either push or pull directly toward or away from you.

7. Attach the tubing to the well cap.

Connect the Pump to the Tubing

To connect the pump to the tubing, follow these steps.

1. Separate the discharge (larger) tubing from the air-supply (smaller) tube for 8 to 12 inches from one end.
2. Loosen the nut-and-ferrule assembly as much as possible without actually removing the nut.
3. Push the air-supply tube into the matching fitting on the top end of the pump.
4. Tighten the nut.
5. Cut off a short length from the end of the discharge tubing to compensate for the offset height of the discharge tube fitting.

> **Note:** This is usually 3 to 4 inches. You determine the exact length by checking both fitting nuts for full tube insertion after loose assembly.

6. Make sure that the tube-to-pump fit is correct before proceeding.



7. Tighten both fitting nuts finger tight
8. For each fitting nut, hold the fitting base with *one* wrench and the fitting nut with *another* wrench, then tighten the fitting nut one additional turn.

Connect the Well Cap to the Tubing

The following sections describe how to connect the discharge and air-supply tubing to the well cap.

Discharge Tubing

To connect the well cap to the discharge (larger) tubing, follow these steps.

1. At the free end of the tubing pair, push the discharge tubing up through all casing adapting fittings and well-cap components.
2. Push the discharge tubing up through the bottom of the matching fitting in the well cap until the tubing extends above the fitting by the amount you want to leave for ease of sample collection.
3. Tighten the discharge tube fitting nut finger tight.

Air-Supply Tubing

To connect the well cap to the air-supply (smaller) tubing, follow these steps.

1. Trim the length of the air-supply tubing to allow connection to the matching tubing fitting beneath the well cap panel.
2. Insert the air-supply tubing into the fitting, then check for full engagement.

6

MAINTAINING YOUR WELL WIZARD SYSTEM

This chapter tells you how to:

- Maintain the water-level meter.
- Maintain Purge Master.
- Install or replace well-cap tubing ferrules
- Install or replace pump connectors.

If you'd prefer to *not* do these things yourself, or if you have questions, call QED. If you need to replace an 1100 or 1200 series pump bladder, refer to the instructions included with the field-replaceable bladder kit.

Maintain the Model 6010E Water-Level Meter

The Model 6010E Electronic Pneumatic water-level meter needs little maintenance. However, you need to change the batteries from time to time. You may also want to check the calibration prior to each sampling event. The following sections tell you how.

Change the Batteries

The water-level meter comes with eight size AA alkaline batteries. They're located under the black **BATTERY SERVICE ACCESS** panel. The batteries should provide about 40 hours of continuous operation. When you press the **START** button, if you see the message **Warning! Low Batteries**, you can press the **START** button again to make the batteries last a little longer, but you need to replace them *soon*.

If you see the message **Battery Too Low! Turn System Off**, you can't use the water-level meter until you replace the batteries.

Calibrate the Water-Level Meter

To calibrate the water-level meter, follow these steps.

1. Set up the optional calibration test tube in its stand.
2. Add water to the calibration test tube, to a convenient level on the scale.
3. Attach the red pump air-supply line to the **TANK RECHARGE** fitting.
4. To charge the internal air tank to 100 psi, set the cycle timers for *maximum discharge* time and *minimum refill* time, as follows:
   - **For the Model 3013**, set the **DISCHARGE** timer at **C** and the **REFILL** timer at **A**.
   - **For the Model 350**, set the **DISCHARGE** timer at **9 O'CLOCK** and the **REFILL** timer at **7 O'CLOCK**.
5. Disconnect the red pump air-supply line.
6. Move the **SENSOR** switch to **ON**.
7. Attach the meter air hose from the **TO PROBE** fitting to the mating well cap connection.
8. Move the **AIR** switch to **ON**, then press **START** once.

9. Watch the display until it shows the highest reading–you see the numbers increase, then stabilize at the highest reading.
10. When the message **Probe Submersion Depth...** appears, compare the meter reading to the actual level in the test tube inside the calibration tube.
11. Move the **AIR** switch to **OFF**.
12. If the meter reading and the actual level match, meter calibration is correct and you can skip the following steps; otherwise, remove the **CALIBRATION** panel screw, then use a small screwdriver or other tool to remove the epoxy seal from the internal adjustment screw.
13. Slowly adjust the internal screw until the meter reading matches the actual level.
14. Repeat Steps 6 through 12 to re-check calibration.
15. Apply a dab of paint or epoxy to the lock-calibration screw to lock it in position, then reinstall the **CALIBRATION** panel screw.

Maintain Purge Master

During the winter in northern climates, to prevent the discharge tubing of your Purge Master from *freezing*, you need to clear the discharge line of standing water above the static water level. To do that, before disconnecting the air supply from Purge Master, set the discharge cycle time on the controller long enough to cause air to exit from the Purge Master discharge line—blowing all the water out of the discharge tubing.

Maintain the Model 350 Electronic Controller

The following sections describe how to maintain your Model 350 Electronic Controller.

General Care & Storage

Although the controller is protected from moisture, QED recommends that you protect the unit from direct rain. A dry storage area in the 40 to 100°F temperature range is best. If you plan to store the controller for an extended period, remove the batteries.

Cold-Weather Usage

You can use the controller in sub-freezing temperatures but, if you let the controller sit in a sub-freezing environment without cycling, condensed water in the valve may freeze. If that happens, warm the controller to above freezing to make it resume cycling. Once you have it cycling, you can return it to the freezing conditions for use.

Batteries

The Model 350 Electronic controller is powered by eight size AA batteries (QED recommends alkaline). Battery life depends largely on controller use and the temperature in which you use the controller. Batteries last longer at room temperature than at lower temperatures; intermittent controller use provides longer battery life than continuous use. You can typically obtain 130,000 cycles from a set of batteries–that's about 14 days of continuous 24-hour-per-day use.

Battery Testing

You can press the **BATTERY TEST** button to find out the condition of the batteries.

- A continuous green light indicates fresh batteries.
- A split-second flash of green light–or no light–indicates that you will soon need to replace the batteries.

It isn't unusual to obtain an additional 30,000 cycles (about 4 days of continuous operation) of battery life after the battery test light fails to remain continuous.

Notes:

- If you press the **BATTERY TEST** button often, you'll need to replace the batteries more often.
- If the controller doesn't start spontaneously when you connect the air source, press the **BATTERY TEST** button to start the controller.

Battery Replacement

To replace the eight size AA batteries, follow these steps.

1. Remove the four screws that hold the battery case panel on the controller front panel.
2. Remove the panel to expose the battery holder.
3. To remove the battery holder from the case, *gently* unclasp the transistor-battery-type connector panel.
4. Remove the old batteries, saving them to recycle.
5. Insert the new batteries.
6. Insert the battery holder in the case, then reconnect the transistor-battery-type connector panel.
7. Reinstall the battery case panel, replacing the four set screws

Install or Replace Well-Cap Tubing Ferrules in a Typical Well Cap

The following sections describe how to replace or install well-cap tubing ferrules. Most people never need to perform either of these procedures. You may need them, however, if you want to re-position the pump or replace kinked tubing.

Unscrew Fitting Caps & Expose Ferrules

Refer to Figure 6-1 as you follow these steps.

1. Using a wrench, loosen the pump discharge fitting cap by turning it counterclockwise.

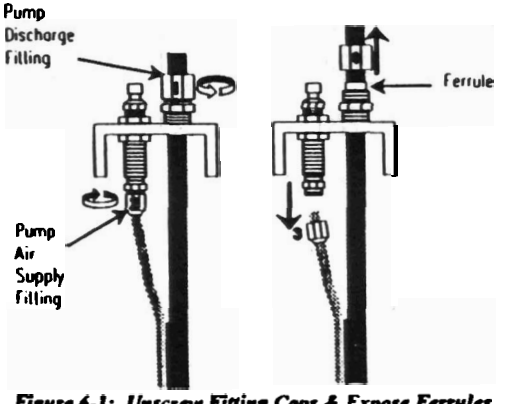


Figure 6-1: Unscrew Fitting Caps & Expose Ferrules

2. Using a wrench, loosen the pump air-supply fitting cap by turning it counterclockwise.
3. Pull the pump air-supply tubing down and out of the fitting.

4. Slide the pump discharge fitting cap up the tube to expose the ferrule.

Discard Tubing & Ferrule, Save Cap for Re-Use

Refer to Figure 6-2 as you follow these steps.

1. Pull the pump discharge tubing up through the cap to allow access to the ferrule.

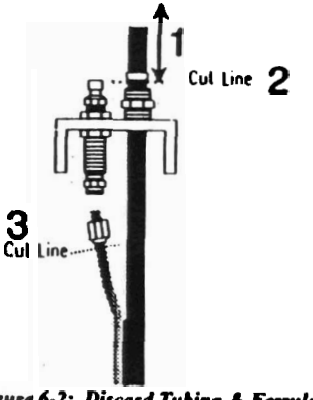


Figure 6-2: Discard Tubing & Ferrule

2. Cut the pump discharge tubing just behind the ferrule.
3. Cut the pump air-supply tubing just behind the fitting cap.
4. Discard the portions you just cut off, saving the fitting caps for re-use.

Re-Attach the Fitting Caps

Refer to Figure 6-3 as you follow these steps

1. Re-attach the pump discharge fitting cap with the new ferrule (smaller end down)—leaving it slightly loose to allow the tube to pass through.
2. Attach a new nut to the pump air-supply tubing—leaving it slightly loose to allow tubing to pass through.

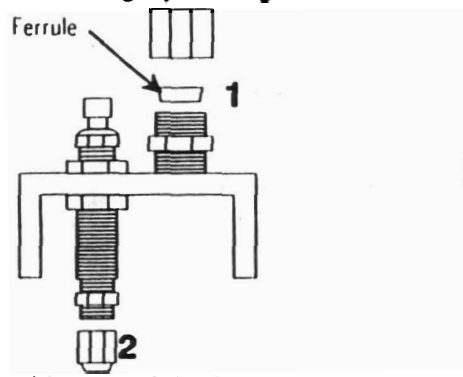


Figure 6-3: Re-Attach the Fitting Caps

Re-Connect the Tubing

Refer to Figure 6-4 as you follow these steps.

1. Separate the tubing for about 6 to 12 inches.

Caution: Don't pull tubing apart *sideways*—it may tear. Instead, hold the larger tube stationary with one hand. Then, with the smaller tube in the other hand, either push or pull directly toward or away from you.

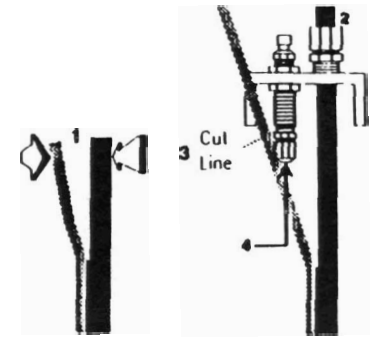


Figure 6-4: Re-Connect the Tubing

2. Push the pump discharge tubing through the pump discharge fitting to the desired length, then tighten the nut.

Note: The length you want depends on the clearance required for any protective casing. You typically need about 1-1/2 feet.

3. Cut the air-supply tubing to size, to allow it to reach *all* the way into the fitting.
4. Push the air-supply tubing all the way into the fitting until it contacts the shoulder inside the fitting, then tighten the nut.

Install or Replace Pump Connectors

The following sections described how to install or replace the three types of connectors that may be included in your Well Wizard system.

Stainless Steel Connectors

Swagelok™ tube fittings, which include four pieces (see Figure 6-5), come to you completely assembled, finger tight.

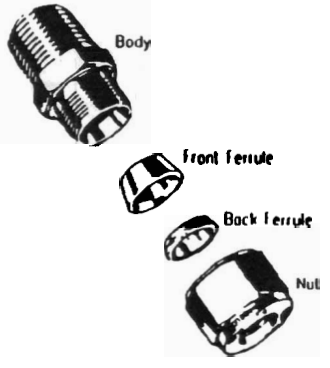


Figure 6-5: Parts of the Swagelok Tube Fitting

Caution: If you disassemble a connector before you use it, dirt or foreign material can get into the fitting and later cause a leak.

To install a stainless steel connector, follow these steps

1. If you're working with a 1/2- or a 3/4-inch connector, wrap the male threads under the nut with Teflon tape.

2. Insert the tubing into the Swagelok tube fitting as follows:
   - **For 1/4-inch tubing**, insert it approximately 5/8 inch
   - **For 3/4-inch tubing**, insert it up to 7/8 inch.

   Make sure that the tubing firmly contacts the shoulder of the fitting and that the nut is finger tight.

   Note: If the tubing is 3/8 inch or larger, you must use a tubing insert. Just push the stainless steel insert into the tubing before inserting the tubing into the tube fitting.

3. Referring to Figure 6-6, scribe or mark the nut at the 6 o'clock position.

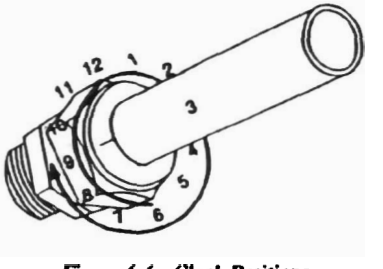


Figure 6-6: Clock Positions

4. While holding the fitting body steady with a backup wrench or vise, tighten the nut as follows, depending on the size of the tube fitting:
   - **For fittings larger than 3/16 inch**, turn the fitting one and one-quarter turns (watch the scribe mark make one complete turn, then continue to 3-o'clock).
   - **For fitting sizes 1/6, 1/8, and 3/16 inch**, turn the fitting three-quarters of a turn (watch the scribe mark turn to 9 o'clock).

   Note: These are guidelines, you may need to further tighten the nut.

Purge Master Barb-and-Clamp Connectors

To install Purge Master barb-and-clamp connectors, follow these steps, referring to Figure 6-7. Have handy the 2-inch purge pump clamp tool (Part Number 35188) that's available from QED.

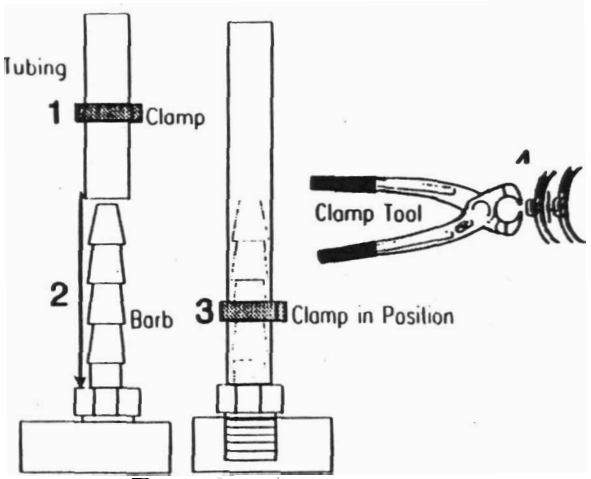


Figure 6-7: Barb & Clamp Connector

1. If you're replacing an old connection, remove the old clamp by cutting through its ear with the clamp tool; otherwise, skip to Step 2.
2. Cut the tubing cleanly and squarely to length.
3. Slide the clamp onto the tubing, then push the tubing onto the barb fitting until the tube contacts the body hex.
4. Position the clamp on the tubing outside of where the barb is positioned in the tube, making sure the hooks on the clamp band are engaged.
5. Squeeze the ear closed with the clamp tool.

Polypropylene Connectors

To install a polypropylene connector, follow these steps.

1. Cut the tubing cleanly and squarely to length.
2. If the tubing is larger than 1/2 inch, push an insert into the tube.
3. Push the tubing into the completely assembled connector until it contacts the shoulder inside the fitting (see the illustration on the left in Figure 6-8).
4. Tighten the nut with a wrench, but be careful to not over tighten it; the nut should not come in contact with the shoulder of the body (see the illustration on the right in Figure 6-8).

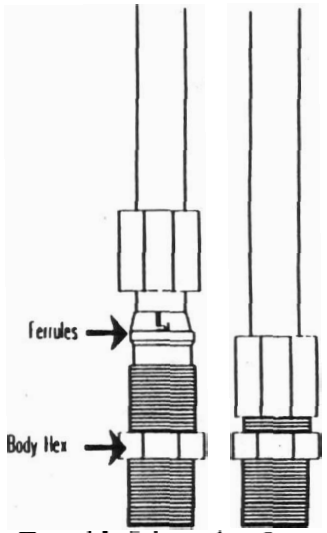


Figure 6-8: Polypropylene Connector

APPENDIX A
SPECIFICATIONS

The following sections provide specifications for Well Wizard controllers and the various Well Wizard sampling system types.

Standard Controller/Compressor

Table A-1 shows compressor performance for the standard controller/compressor cart, Model 3111HR/LR.

Table A-1: Model 3111HR/LR Performance

Air Flow (scfm)	Pressure (psig)
6.0	0
5.5	25
4.7	50
4.3	100

Other specifications are as follows:

- 200 feet maximum lift with *compressor* air source.
- 250 feet maximum lift with *compressed-gas cylinder* air source (regulator set at 125 psi).
- 2.5 hours of operation on a full tank of gasoline.

High-Pressure Controller/Compressor

Table A-2 shows compressor performance for the high-pressure controller/compressor cart, Model 3111HP/LH.

Table A-2: Model 3111HP/LH Performance

Compression (scfm)	Pressure (psig)
2.4	0
2.27	70
2.2	125
2.1	165

Other specifications are as follows:

- 320 feet maximum lift with the supplied *compressor* air source.
- 600 feet maximum lift with *compressed-gas cylinder* air source (regulator set at 300 psi).
- 2.5 hours of operation on a full tank of gasoline.

Well Wizard Equipment Configurations

Well Wizard sampling systems are available in Types A through L, as shown in the following figures. Type A is the basic sampling pump; the other types include options using Purge Mizer and Purge Master in various positions relative to the sampling pump. The diagram letters appear on the "Downwell Equipment Build/Specification Sheet(s)" supplied with your Well Wizard system.

Sampling System Type A

Figure A-1 shows the Type A sampling system, the basic bladder pump.

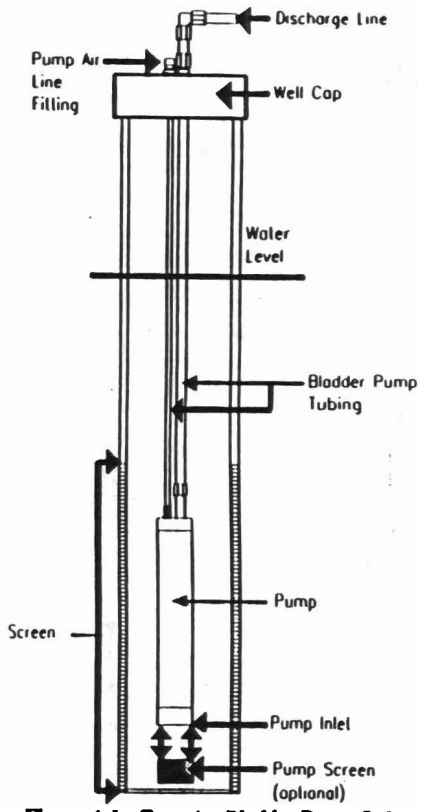


Figure A-1: Type A—Bladder Pump Only

Sampling System Type B

Figure A-2 shows the Type B sampling system, the bladder pump *below* a Purge Master.

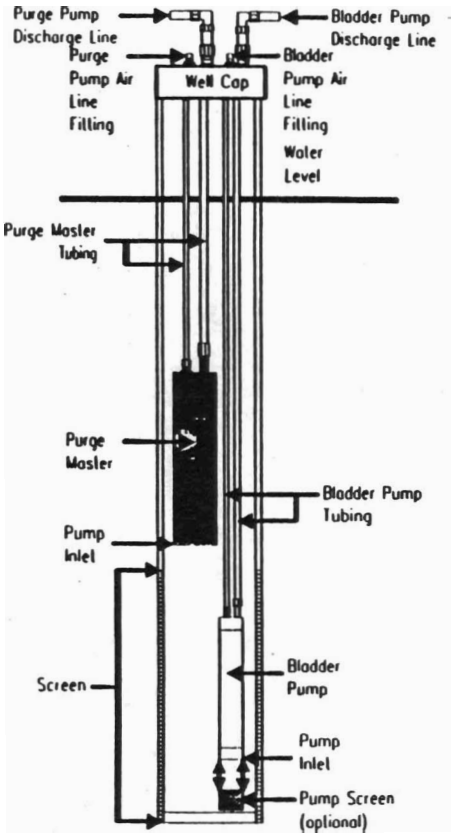


Figure A-2: Type B—Bladder Pump Below a Purge Master

Sampling System Type C

Figure A-3 shows the Type C sampling system, a bladder pump *above* a Purge Master.

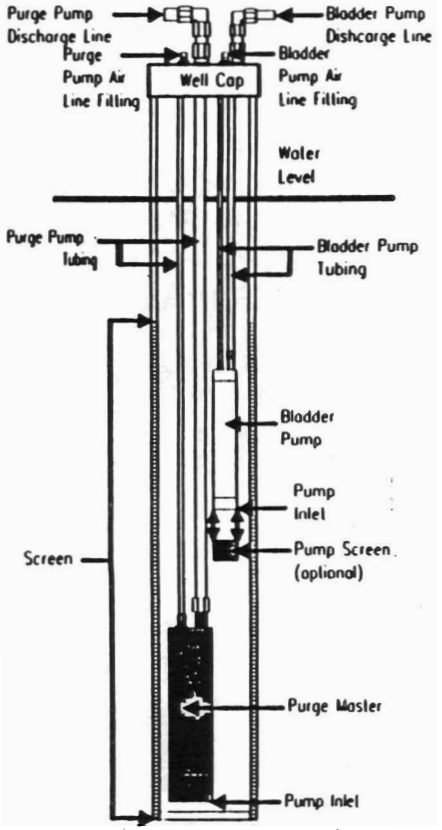


Figure A-3: Type C—Bladder Pump Above a Purge Master

Sampling System Type D

Figure A-4 shows the Type D sampling system, a bladder pump above a Purge Mizer with an inlet extension.

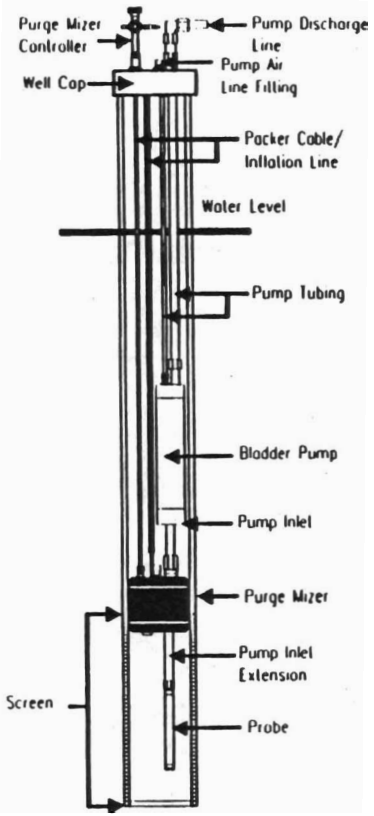


Figure A-4: Type D—Bladder Pump Above Purge Mizer with Extension

Sampling System Type E

Figure A-5 shows the Type E sampling system, a bladder pump *below* a Purge Mizer.

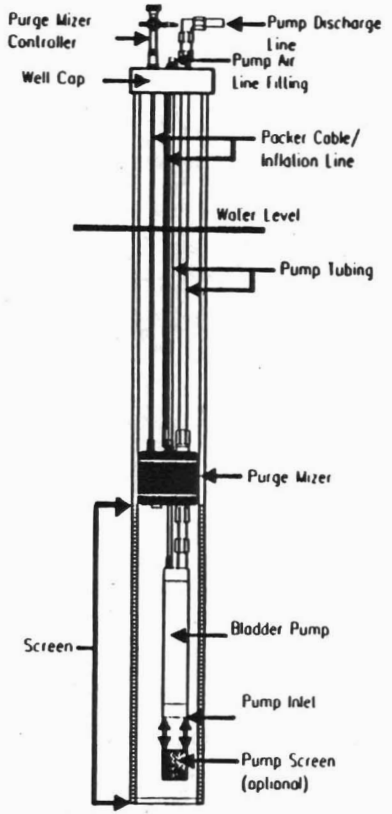


Figure A-5: Type E—Bladder Pump Below a Purge Mizer

Sampling System Type F

Figure A-6 shows the Type F sampling system, a bladder pump with electric submersible *above*.

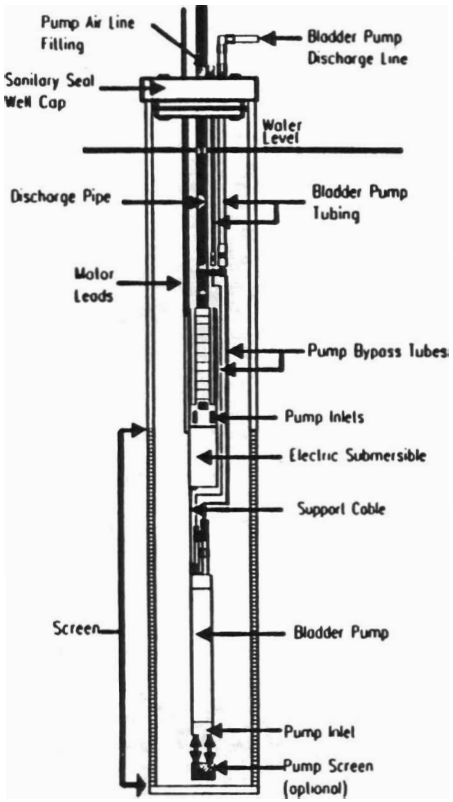


Figure A-6: Type F—Bladder Pump with Electric Submersible Above

Sampling System Type G

Figure A-7 shows the Type G sampling system, a bladder pump with electric submersible *below*.

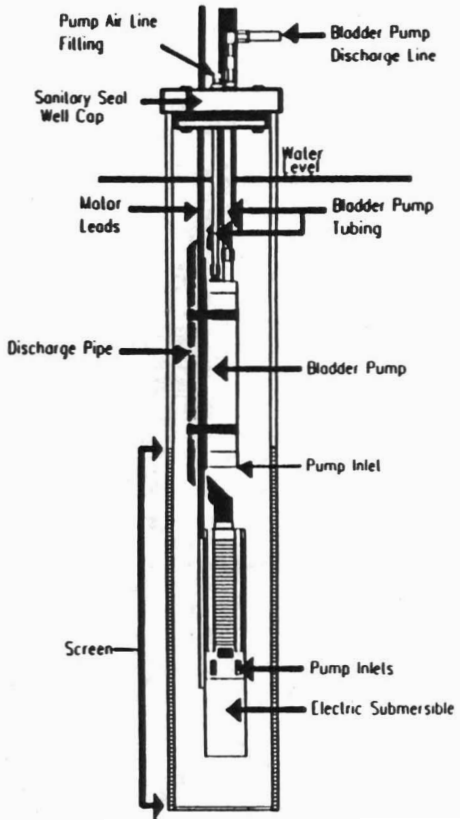


Figure A-7: Type G—Bladder Pump with Electric Submersible Below

Sampling System Type H

Figure A-8 shows the Type H sampling system, a bladder pump with Purge Master and Purge Mizer.

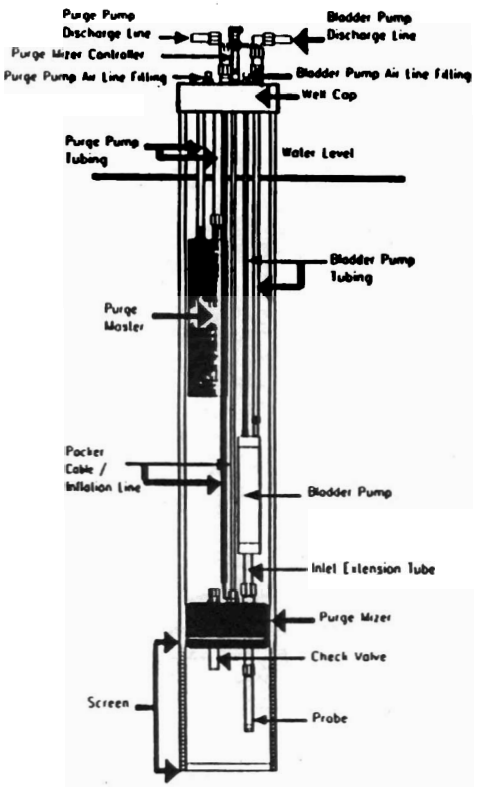


Figure A-8: Type H—Bladder Pump with Purge Master and Purge Mizer

Sampling System Type I

Figure A-9 shows the Type I sampling system, a bladder pump with tandem Purge Mizers.

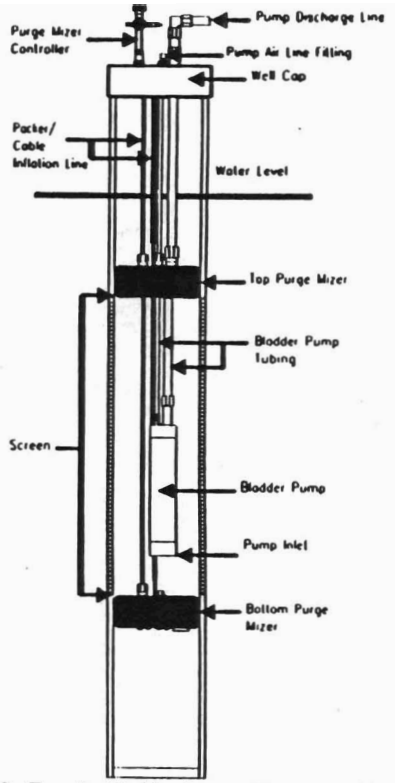


Figure A-9: Type I—Bladder Pump with Tandem Purge Mizers

Sampling System Type J

Figure A-10 shows the Type J sampling system, a bladder pump with Purge Master and Purge Mizer.

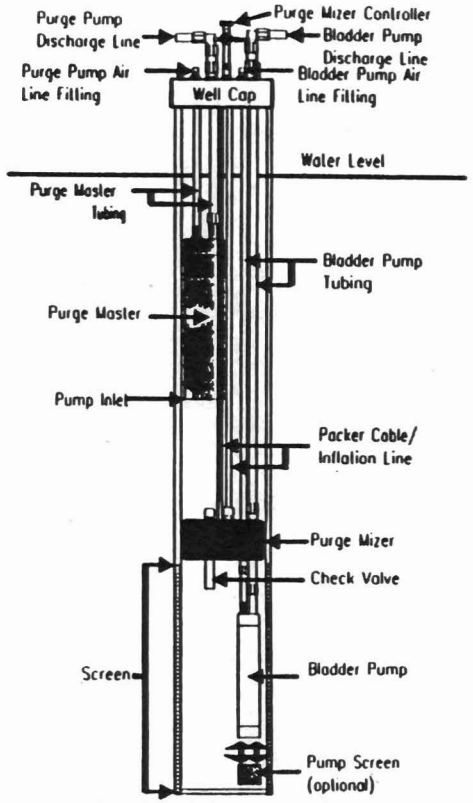


Figure A-10: Type J—Bladder Pump with Purge Master and Purge Mizer

Sampling System Type K

Figure A-11 shows the Type K sampling system, a bladder pump below a Purge Mizer with a vent line.

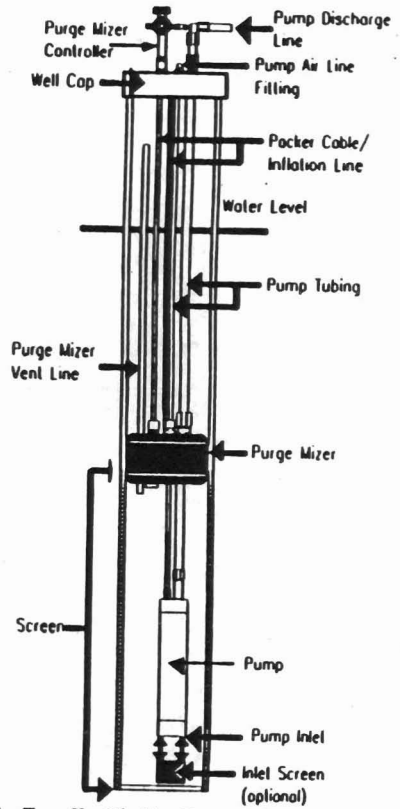


Figure A-11: Type K—Bladder Pump Below a Purge Mizer with a Vent Line

Sampling System Type L

Figure A-12 shows the Type L sampling system, a bladder pump with an inlet extension.

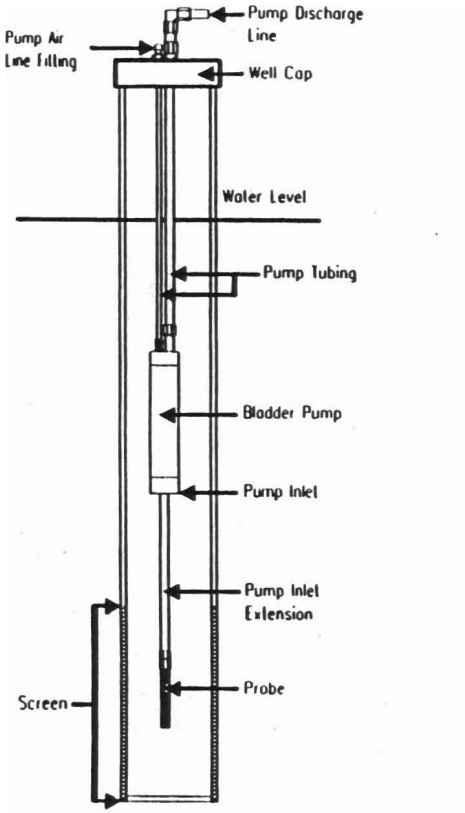


Figure A-12: Type L—Bladder Pump with an Inlet Extension

APPENDIX B
MY WELL WIZARD IS BROKEN: WHAT TO DO

QED sometimes gets calls from customers who say, "My Well Wizard is broken. What should I do?" We *want* to help–and we *will* help–but first we need to know the symptoms. As described in this book, your Well Wizard is a *system* that includes many components. Together we can discover the problem, solve it, and have your system up and running again before long. The following sections provide the trouble-shooting information you need to get a solution started.

Warning! Don't disassemble any component of your Well Wizard system. Doing that could void your warranty coverage.

Perform These Three Checks

If you have a problem, the following three checks will help to either locate the problem or assist in our diagnosis and repair. In case you later have to call QED, write down your findings as you perform these checks–so you can tell us what happened when you performed them.

Note: The components of your Well Wizard system and the correct ways to use them are described earlier in this book. If you're new to Well Wizard, before you decide that you have a problem, please take a few minutes to become familiar with the system and how to operate it.

Check Controller Cycling and Pressure

Make sure the controller is cycling and attaining a pressure of at least 80 psi in 60 seconds. You *may* have to turn the **FLOW THROTTLE** control knob fully clockwise and set the **DISCHARGE** timer knob on **F** for the Model 3013 or **5 O'CLOCK** for the Model 350 to achieve this pressure.

Check Cycle Length Adjustment

Make sure that you can change the cycle length by adjusting the **REFILL** and **DISCHARGE** timer knob positions.

Check for Sufficient Discharge Volume

Make sure that the discharge volume is as high as it should be. To do that, follow these steps.

1. Set the **REFILL** and **DISCHARGE** timer knobs to **F** for the Model 3013 or **5 O'CLOCK** for the Model 350.
2. Measure the volume of one discharge cycle. The volume should be as follows:
   - **For 1100 series pumps,** the volume should be greater than 300 ml.
   - **For 1200 series pumps,** the volume should be greater than 400 ml.
3. If the volume is low, check for the following:
   - Insufficient submergence of the pump.
   - A well-water recovery rate that's too slow.
   - A leaky discharge fitting or leaky tubing.

Call QED, if Necessary

If the three checks didn't reveal a minor problem that you can easily fix–such as a loose fitting–please call our Customer Service department at one of the following numbers for assistance.

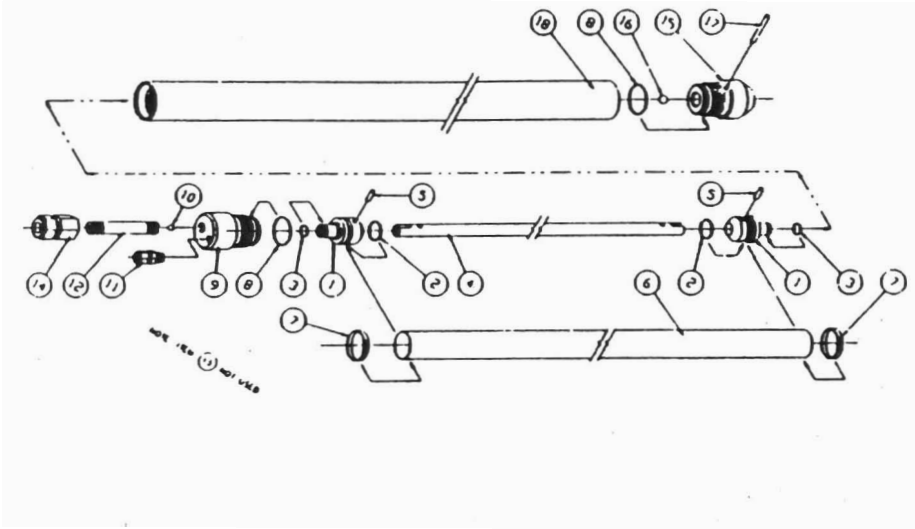
- **Monday through Friday, 8:00 a.m. to 5:00 p.m. EST:** (313) 995-2547.
- **After hours and weekends:** 1-800-272-9559 (*or* 1-313-746-8045 if you're outside the U.S.).

The person you talk to may ask you to look at a schematic drawing or to refer to a parts list. The schematic drawings and parts lists are in Appendix C.

APPENDIX C
DRAWINGS & PARTS LISTS

The following schematic drawings and parts lists for the various Well Wizard components and configurations are here for your reference. For example, they may be helpful to you if you talk to someone in the QED Customer Service department.

P1101H Assembly



QTY LIST	NOTES	by/date	made @	Ck'd @	date	QTY	NOTES	by/date	made @	Ck'd @	date
-	REL FOR PROD	ECO-3030	JRV	LH	17JAN92						

ITEM	P/N	DESCRIPTION	QTY
18	12030	CASING PVC	1
17	16051	PIN RETAINER TEFLON	1
16	34465	BALL 7/16" TEFLON	1
15	13010	HOUSING INLET PVC	1
14	34640	CONNECTOR 1/2T X 1/4 FPT	1
13			
12	34639EP	NIPPLE DISCHARGE 1/4 MPT POLISHED	1
11	12022	CONNECTOR 1/4 X 1/8 MPT	1
10	34464	BALL 5/16" TEFLON	1
9	11310	HOUSING DISCHARGE PVC	1
8	34471	O-RING HOUSING PVC	2
7	35051	CLAMP SE27.36-505R 304	2
6	35240	BLADDER,1100 TFE	1
5	16050	PIN 3/16" TEFLON	2
4	14020	ROD CENTER PVC	1
3	34470	O-RING SPOOL PVC	2
2	35049	O-RING 2-211 VITON	2
1	16021	SPOOL,PVC	2

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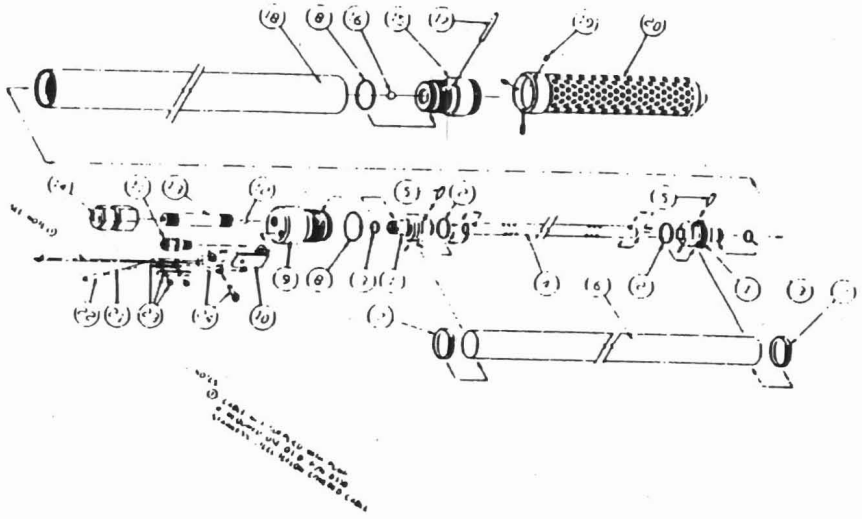
drawn by JRV	date 17JAN92	approved by DHE	date 17JAN92
checked by LH	date 17JAN92		
	P1101H		

TITLE
PARTS LIST
P1101H ASS'Y

drawing number P1101H@ QTY -

SCALE — SHEET 1 OF 1

ST1101P Assembly



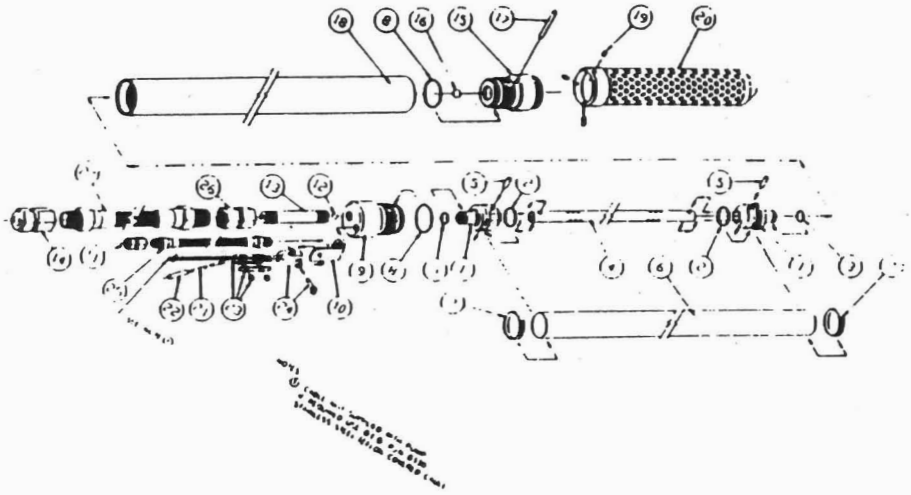
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23	34876EP	CLAMP,CABLE STAINLESS STEEL-EP	2
22	34878	TUBE, SHRINK 131 DIA TEFLON	1
21	34898	ROD, 094 DIA TEFLON	1
20	35192EP	SCREEN,STAINLESS STEEL-EP PUMP	1
19	35190	SCREW, #8-32 X 3/16" SS SOCKET HEAD	3
18	35257EP	CASING 1100 304 STAINLESS STEEL-EP	1
17	16051	PIN RETAINER TEFLON	1
16	34465	BALL 7/16" TEFLON	1
15	35254	INLET, STAINLESS STEEL	1
14	34640	CONNECTOR 1/21 X 1/4 FPT	1
13	34639EP	NIPPLE DISCHARGE 1/4" NPT POLISHED	1
12	34464	BALL 5/16" TEFLON	1
11	12022	CONNECTOR 1/4 X 1/8 NPT	1
10	34700EP	BRACKET P-M 2 304 SS POLISHED	1
9	35256	HOUSING DISCHARGE SS	1
8	12015	O-RING BODY VITON	2
7	35051	CLAMP SE27 36-505R 304	2
6	35240	BLADDER,1100 TFE	1
5	16050	PIN 3/16" TEFLON	2
4	16016LP	ROD SS CENTER EP	1
3	16065	O-RING SPOOL VITON	2
2	35049	O-RING 2-211 VITON	2
1	16012	SPOOL, TEFLON	2

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DRAWN BY JRV	DATE 22JAN92	APPROVED BY DME	DATE 22JAN92
CHECKED BY LN	DATE 22JAN92		
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DRAWING NUMBER ST1101PB REV -
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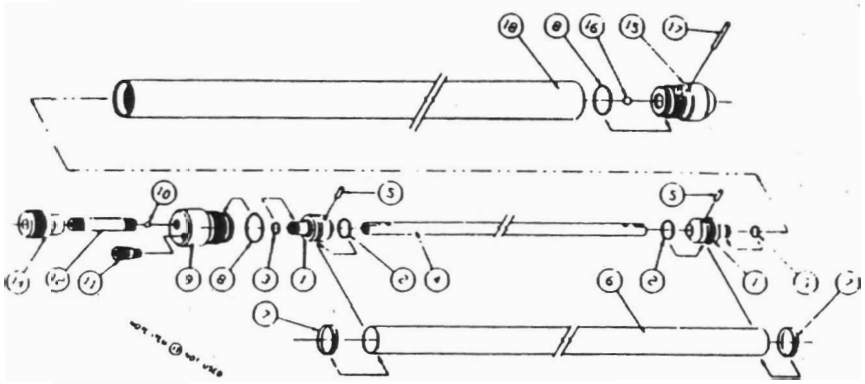
ST1101PF Assembly



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27	35904	HOSE FLEX STAINLESS STEEL/TEFLON	1
26	35907	COUPLING,REDUCING	1
25	35905	HOSE FLEX STAINLESS STEEL/TEFLON	1
24	34877EP	SHACKLE 316 STAINLESS STEEL-EP	1
23	34876EP	CLAMP,CABLE STAINLESS STEEL-EP	2
22	34878	TUBE, SHRINK 131 DIA TEFLON	1
21	34838	ROD, 094 DIA TEFLON	1
20	35192EP	SCREEN,STAINLESS STEEL-EP PUMP	1
19	35190	SCREW, #8-32 X 3/16" SS SOCKET HEAD	3
18	35257EP	CASING 1100 304 STAINLESS STEEL-EP	1
17	16051	PIN RETAINER TEFLON	1
16	34465	BALL 7/16" TEFLON	1
15	35254	INLET, STAINLESS STEEL	1
14	34840	CONNECTOR 1/2T X 1/4 FPT	1
13	34839EP	NIPPLE DISCHARGE 1/4" MPT POLISHED	1
12	34464	BALL 5/16" TEFLON	1
11	35906	CONNECTOR 1/4T X 1/8 FPT	1
10	34700EP	BRACKET P-M 2" 304 SS POLISHED	1
9	35256	HOUSING DISCHARGE SS	1
8	12015	O-RING BODY VITON	2
7	35051	CLAMP SC27 36-505R 304	2
6	35240	BLADDER,1100 TPE	1
5	16050	PIN 3/16" TEFLON	2
4	16016EP	ROD SS CENTER EP	1
3	16065	O-RING SPOOL VITON	2
2	35049	O-RING 2-211 VITON	2
1	16012	SPOOL, TEFLON	2

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	LN 22JAN92		ST1101FB

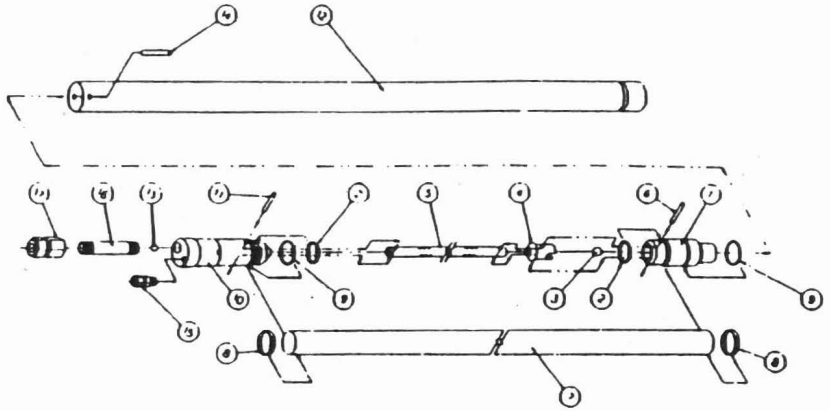
T1100 Assembly



ITEM	P/N	DESCRIPTION	QTY
18	16000	CASING TEFLON	1
17	16051	PIN RETAINER TEFLON	1
16	34465	BALL 7/16" TEFLON	1
15	16035	HOUSING INLET TEFLON	1
14	34531	CONNECTOR 1/2T x 1/4 MPT TEFLON	1
13			
12	34483	NIPPLE 1/4 MPT x 3" TEFLON	1
11	34458	CONNECTOR 1/4T x 1/8 MPT TEFLON	1
10	34464	BALL 5/16" TEFLON	1
9	16030	HOUSING DISCHARGE TEFLON	1
8	16070	O-RING HOUSING VITON	2
7	35051	CLAMP SE27 36-505R 304	2
6	35240	BLADDER 1100 TFE	1
5	16050	PIN 3/16" TEFLON	2
4	16015	ROD CENTER TEFLON	1
3	16065	O-RING SPOOL VITON	2
2	35049	O-RING 2-211 VITON	2
1	16011	SPOOL,CARTRIDGE	2

QED Environmental Systems Inc 6095 Jackson Rd Ann Arbor, MICH	JRV 17JAN92	DME 17JAN92	PARTS LIST T1100 ASS'Y	
	LN 17JAN92		T1100B	
	T1101			

P1201 Assembly



ITEM	P/N	DESCRIPTION	QTY
17	34446	CONNECTOR 1/2T x 3/8 FPT POLYPROPYLENE	1
16	12020EP	NIPPLE DISCHARGE 316 SS POLISHED	1
15	34452	CONNECTOR 1/4T x 1/8 MPT POLYPROPYLENE	1
14	12013EP	PN BODY POLISHED	1
13	34483	BALL 7/16" TEFLON	1
12	35292EP	CASING EP-SS	1
11	12012EP	PN ROD CENTER POLISHED	1
10	35299	HOUSING DISCHARGE PVC	1
9	12015	O-RING BODY VITON	2
8	35297	CLAMP SE0305-SOSR SS	2
7	35217	BLADDER 1200 TE	1
6	35203EP	PN EP INLET CENTER ROD	1
5	35294EP	CENTER ROD EP-SS	1
4	35302	INSERT INLET PVC	1
3	35295	BALL 9/16" DIA TEFLON	1
2	35284	O-RING 2-213 VITON	2
1	35301	HOUSING INLET PVC	1

REL FOR PROD — JRV LN 1 9 92

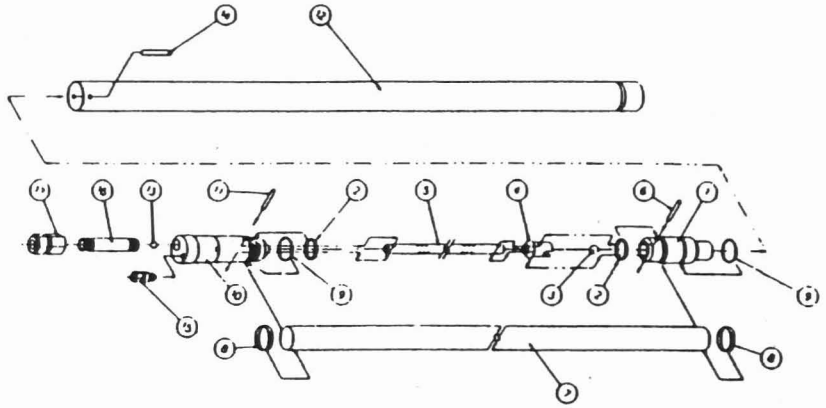
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ENVIRONMENTAL SYSTEMS INC
6035 JACKSON RD
ANN ARBOR MICH

JRV 9JAN92 — LN 9JAN92 — DME 9JAN92 — P1201

TITLE
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P1201 ASS'Y

DRAWING NUMBER P1201B — SHEET 1 OF 1

P1201H Assembly



REV LTR	ZONE	REVISION	BY	DATE	CHK'D	APP'D
-		REL FOR PROD	JRV	LN	1 9 02	

ITEM	P/N	DESCRIPTION	QTY
17	34830	CONNECTOR 1/2I x 3/8 FPT SS	1
16	12020EP	NIPPLE DISCHARGE 316 SS POLISHED	1
15	12022	CONNECTOR 1/4T x 1/8 MPT SS	1
14	12013EP	PIN BODY POLISHED	1
13	34485	BALL 7/16" TEFLON	1
12	35292EP	CASING EP-SS	1
11	12012EP	PIN ROD CENTER POLISHED	1
10	35303	HOUSING DISCHARGE PVC	1
9	12015	O-RING BODY VITON	1
8	35297	CLAMP SE0305-505R SS	2
7	35217	BLADDER 1200 TFE	2
6	35283EP	PIN EP INLET CENTER ROD	1
5	35284EP	CENTER ROD EP-SS	1
4	35302	INSERT INLET PVC	1
3	35285	BALL 9/16" DIA TEFLON	1
2	35286	O-RING 2-213 VITON	1
1	35301	HOUSING INLET PVC	2

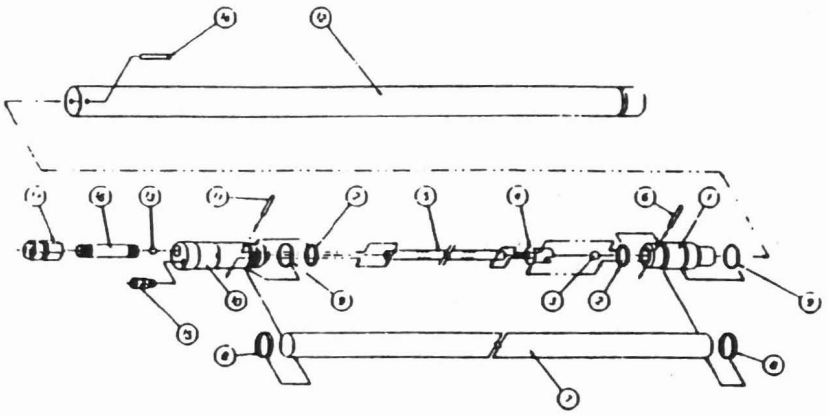
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ENVIRONMENTAL SYSTEMS INC
6095 JACKSON RD
ANN ARBOR MICH

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PROJECT MGR LN	DATE 8JAN02		
	P1201H		

TITLE
PARTS LIST
P1201H ASS'Y

DRAWING NUMBER P1201H REV -
SCALE - SHEET 1 OF 1

T1200 Assembly



ITEM	P/N	DESCRIPTION	QTY
17	34830	CONNECTOR 1/2T x 3/8 FPT SS	1
16	12020EP	NIPPLE DISCHARGE 316 SS POLISHED	1
15	12022	CONNECTOR 1/4T x 1/8 MPT SS	1
14	12013EP	PIN BODY POLISHED	1
13	34485	BALL 7/16 TEFLON	1
12	35292EP	CASING EP-SS	1
11	12012EP	PIN ROD CENTER POLISHED	1
10	35290	HOUSING DISCHARGE TEFLON	1
9	12015	O-RING BODY VITON	2
8	35297	CLAMP SE0305-505R SS	2
7	35217	BLADDER 1200 TFE	1
6	35283EP	PIN EP INLET CENTER ROD	1
5	35294EP	CENTER ROD EP-SS	1
4	35293	INSERT TEFLON	1
3	35295	BALL 9/16" DIA TEFLON	1
2	35284	O-RING 2-213 VITON	2
1	35291	INLET TEFLON	1

REL FOR PROD — JRV 8JAN92 — LN 8JAN92

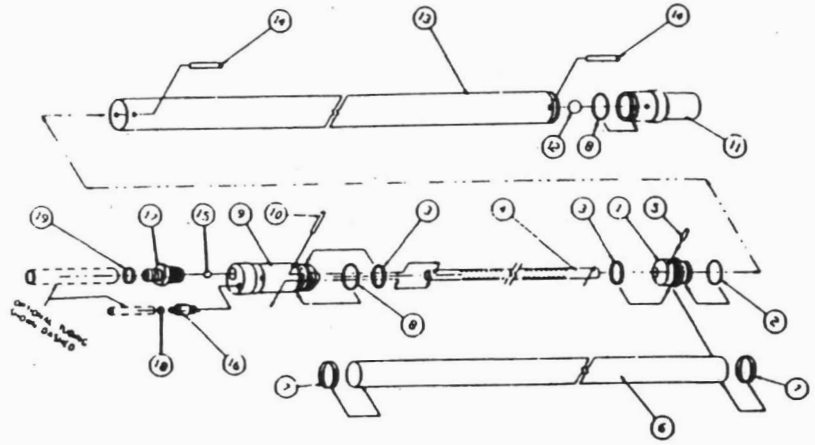
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6095 JACKSON RD
ANN ARBOR MICH

JRV 8JAN92 — LN 8JAN92 — DHE 9JAN92 — T1200

TITLE
PARTS LIST
T1200 ASS'Y

T12000

P1500 Assembly



ITEM	P/N	DESCRIPTION	QTY
-	REL FOR PROD	ECO 2030 JRV LN	
19	35211EP	CLAMP, EP-SS 3/4"	1
18	35209EP	CLAMP EP-SS 1/2"	1
17	35213	BARB 5/8"ID x 3/8" MPT	1
16	35215	BARB 3/8"ID x 1/8" MPT	1
15	34465	BALL 7/16" TEFLON	1
14	12013EP	PIN BODY POLISHED	2
13	35804EP	CASING SS EP	1
12	34687	BALL 3/4 TEF	1
11	35818	INLET, PVC	1
10	12012EP	PIN ROD CENTER POLISHED	1
9	35817	DISCHARGE PVC	1
8	12015	O"-RING BODY VITON	2
7	35297	CLAMP SE0305-505A SS	2
6	35806	BLADDER, TFE	1
5	35825EP	PIN 3/16 SS	1
4	35805EP	CENTER ROD SS EP	1
3	35284	"O"-RING 2-213 VITON	2
2	35813	"O"-RING 2-020 VITON	1
1	35819	SPOOL, INLET PVC	1

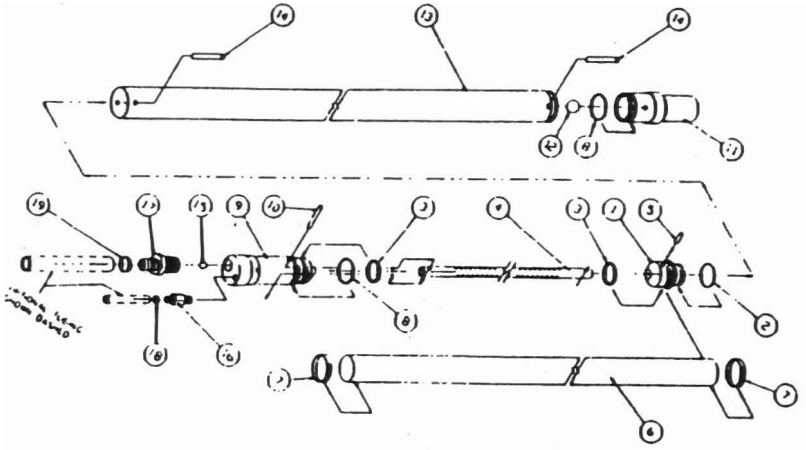
OED
ENVIRONMENTAL SYSTEMS INC
6095 JACKSON RD
ANN ARBOR, MICH

DRAWN BY JRV 13JAN92
CHECKED BY LN 13JAN92
APPROVED BY DME 13JAN92
P1500

TITLE
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P1500 ASS'Y

DRAWING NUMBER P1500B

T1500 Assembly



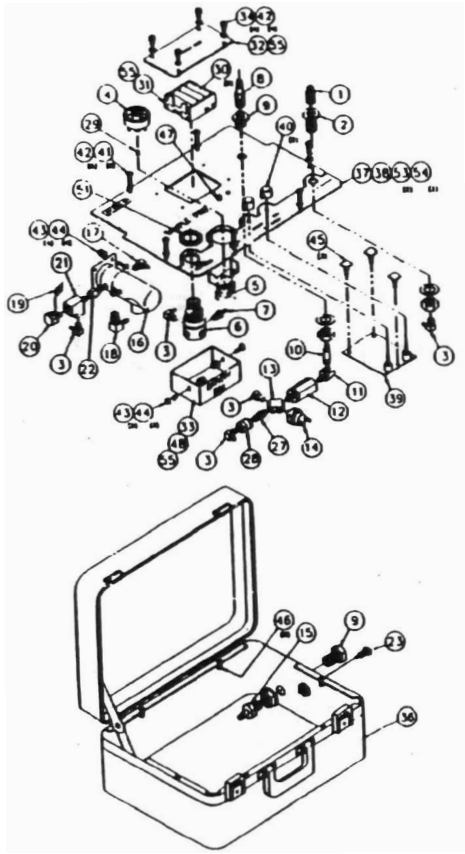
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19	35211EP	CLAMP. EP-SS 3/4"	1
18	35209EP	CLAMP. EP-SS 1/2"	1
17	35213	BARB. 5/8"ID x 3/8" MPT	1
16	35215	BARB. 3/8"ID x 1/8" MPT	1
15	34465	BALL 7/16" TEFLON	1
14	12013EP	PIN BODY POLISHED	2
13	35804EP	CASING SS EP	1
12	34667	BALL 3/4" TEF	1
11	35802	INLET. TEFLON	1
10	12012EP	PIN ROD CENTER POLISHED	1
9	35801	DISCHARGE. TEFLON	1
8	12015	"O"-RING RODY VITON	2
7	35297	CLAMP SL0305-SOSR SS	2
6	35806	BLADDER. TFE	1
5	35825EP	PIN 3/16 SS	1
4	35805EP	CENTER ROD SS EP	1
3	35284	"O"-RING 2-213 VITON	2
2	35813	"O"-RING 2-020 VITON	1
1	35803	SPOOL. INLET TEFLON	1

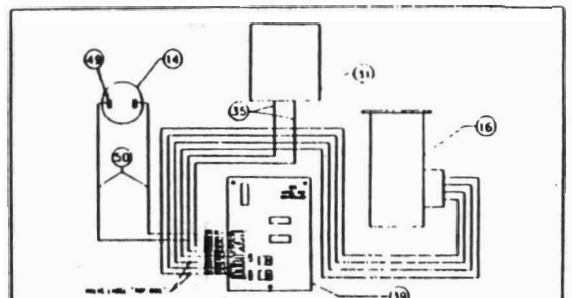
QED
ENVIRONMENTAL SYSTEMS INC
6005 JACKSON RD
ANN ARBOR, MICH

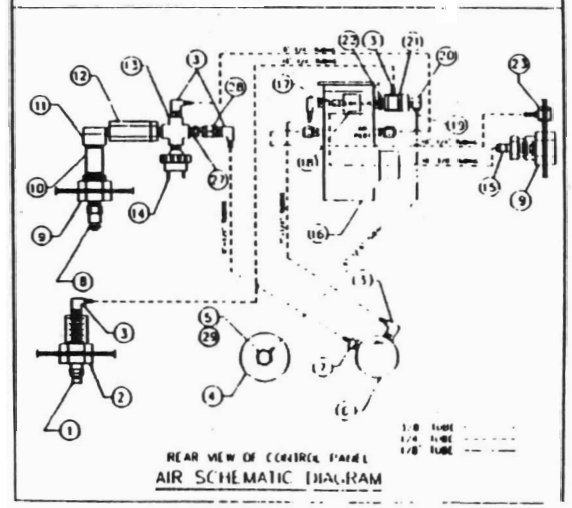
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CHECKED BY LN 13JAN92
APPROVED BY DME 13JAN92
T1500

TITLE
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T1500 ASS'Y
DRAWING NUMBER T15008

350 Controller







350 Controller (continued)

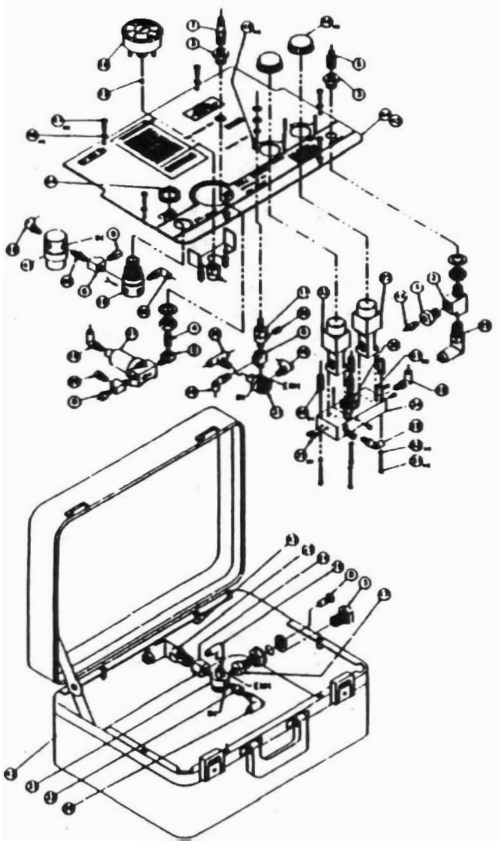
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31	34577	HOLDER, BATTERY
30	34988	BATTERY "AA" ALKALINE
29	36339	PLUG, GAUGE THROTTLE
28	34806	VALVE, CHECK 1/8" FPT
27	35012	NIPPLE, 1/8" MPT HEX
26	36082	TUBING, PARAFLEX PE 3/8" OD
25	35002	TUBING, 1/16" I.D. POLYURETHANE
24	36081	TUBING, PARAFLEX PE 1/4" OD
23	34131	ANCHOR, BARB, DUAL
22	34103	BUSHING, 1/4" X 1/8" BRASS
21	34111	TEE, STREET 1/8" MPT BRASS
20	34212	CONNECTOR ELBOW DYNAMCO
19	35005	CONNECTOR, BARB 1/16"I X #10-32 UNC BRASS
18	34586	ELBOW, 1/4" MPT X 3/8" BARB
17	34585	ELBOW, 1/4" MPT X 1/4" BARB
16	35491	VALVE, HUMPHREY
15	35444	CONNECTOR, 1/4" MPT X 3/8" BARB
14	34578	SWITCH, PRESSURE
13	34812	CROSS 1/8" MPT
12	35048	FILTER, 40 MIC INLINE
11	34616	ELBOW, STREET 1/4" X 1/8"
10	35494	NIPPLE, 1/4" MPT X 1/4" MPT
9	34108	ANCHOR, 1/4" FPT
8	34119	NIPPLE, COUPLER 1/4" SERIES 30
7	34588	CONNECTOR, MALE 1/8" MPT X 1/4" BARB
6	34183	REGULATOR, 125 PSI
5	34208	CONNECTOR, FEMALE DYNAMCO
4	34231	GAUGE, PRESSURE 0-160 PSI
3	34584	ELBOW, 1/8" MPT X 1/4" BARB
2	34129	ANCHOR, 1/8" FPT
1	34132	NIPPLE, COUPLER MOLDMATE 1

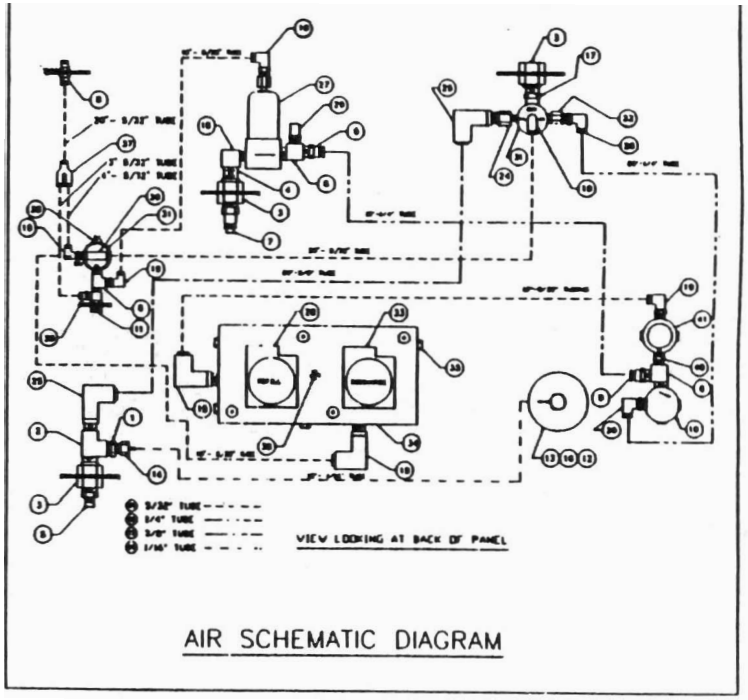
Q.E.D. ENVIRONMENTAL SYSTEMS INC 6095 JACKSON RD ANN ARBOR, MICH.	JN 05MAY92	DHE 05MAY92	TITLE PARTS LIST 350 CONTROLLER
	L.H. 05MAY92		DRAWING NUMBER 350-3 REV -
			SHEET 3 OF 4

QTY	P/N	DESCRIPTION
62	35812	DECAL, INSTRUCTIONS
61	32208	DECAL, SERIAL NUMBER
60	34868	LABEL, BATTERY COVER
59	95018	350 O & T INSTRUCTIONS
58	36288	VIDEO, WW O & M
57	34827	HOSE ASSY, 20' X 1/4" MPT
56	35841	HOSE ASSY, WITH EXHAUST
55	35203	TAPE, 3/4" X 7/16" FOAM
54	36327	TIE, CABLE 8" NARROW
53	34741	HOLDER, NYLON CABLE TIE
52	34122	COUPLER, SERIES 30 1/4" FPT
51	35487	NUT, REG PANEL MTG
50	34589	WIRE, #22 AWG, RED, STRANDED
49	34583	DISCONNECT, QUICH
48	34895	BUSHING, STRAIN RELIEF
47	34883	BOOT, RUBBER SWITCH
46	35208	RIVET, BLIND #10-32
45	34580	SUPPORT, CIRCUIT BOARD
44	34350	LOCKNUT, ELASTIC #10-32
43	34395	SCREW, PAN HEAD #10-32 X 1/2" L
42	34352	WASHER, NATURAL NYLON
41	34361	SCREW, PHILLIPS #10-32 X 3/4" L
40	34425	KNOB, PRINTER
39	35483	CIRCUIT BOARD
38	35482	OVERLAY, 350
37	35471	SUBPLATE, 350
36	35480	CASE, 350
35	34574	LEAD, BATTERY CLIP
34	34737	SCREW, #8-32 BRASS FINGER
33	34573	BOX, BATTERY
32	34735	COVER, BATTERY BOX

Q.E.D. ENVIRONMENTAL SYSTEMS INC 6095 JACKSON RD ANN ARBOR, MICH.	JN 05MAY92	DHE 05MAY92	TITLE PARTS LIST 350 CONTROLLER
	L.H. 05MAY92		DRAWING NUMBER 350-4 REV -
			SHEET 4 OF 4

3013 Controller





AIR SCHEMATIC DIAGRAM

3013 Controller (continued)

ITEM	P/N	DESCRIPTION	QTY
31	35096	VALVE, 3-WAY NC BOOSTER	2
30	35485	CONNECTOR, 5/32" T X #10-32	1
29	36083	VALVE, RELIEF 1/8" MPT, 150 PSI CP	1
28	35002	TUBING, 1/16" I.D. POLYURETHANE	1'
27	35350	FILTER, 5 MIC POLYCAR	1
26	34142	ELBOW, 1/4" T X 1/8" MPT (LEGRIS)	2
25	34831	ELBOW, 3/8" T X 1/4" MPT	2
24	34124	ADAPTOR, 1/8" T X 1/4" FPT	1
23	34845	TUBING, 3/8" O.D. PARAFLEX	15'
22	34844	TUBING, 1/4" O.D. PARAFLEX	25'
21	34843	TUBING, 5/32" O.D. PARAFLEX	65'
20	34835	TIMER, PRT-A10 (REFILL)	1
19	34830	ELBOW, 5/32" T X 1/8" MPT	7
18	34616	ELBOW, STREET 1/4" X 1/8"	1
17	34532	NIPPLE, 1/8" MPT X 1/4" MPT HEX	1
16	34230	GAUGE, PRESSURE CONTROL	1
15			
14	35008	CONNECTOR, BARB 1/16" T X 1/8" MPT BRASS	1
13	34208	CONNECTOR, FEMALE DYNAMCO	1
12	36336	PLUG, GAGE THROTTLE	1
11	34185	VALVE, 2-WAY PUSH	1
10	34183	REGULATOR, 125 PSI	1
9	34143	CONNECTOR, 1/4"T X 1/8"MPT (LEGRIS)	2
8	36092	BULKHEAD, 5/32" T X T	1
7	34119	NIPPLE, COUPLER, SCRES 30, 1/4"MPT	1
6	34111	TEE, STREET 1/8" BRASS	3
5	34110	NIPPLE, COUPLER-MOLDMATE 1/4" MPT	1
4	34109	NIPPLE, 1/4" MPT, BRASS	1
3	34108	ANCHOR, 1/4" FPT	3
2	34104	TEE, STREET 1/4" BRASS	1
1	34103	BUSHING, 1/4" X 1/8" BRASS	1

Q.E.D.
ENVIRONMENTAL SYSTEMS INC
6005 JACKSON RD
ANN ARBOR, MICH

JV 26MAR92 | DHE 26MAR92 | L.N. 26MAR92

TITLE PARTS LIST
3013 CONTROLLER
3013-3 REV -
SHEET 3 OF 4

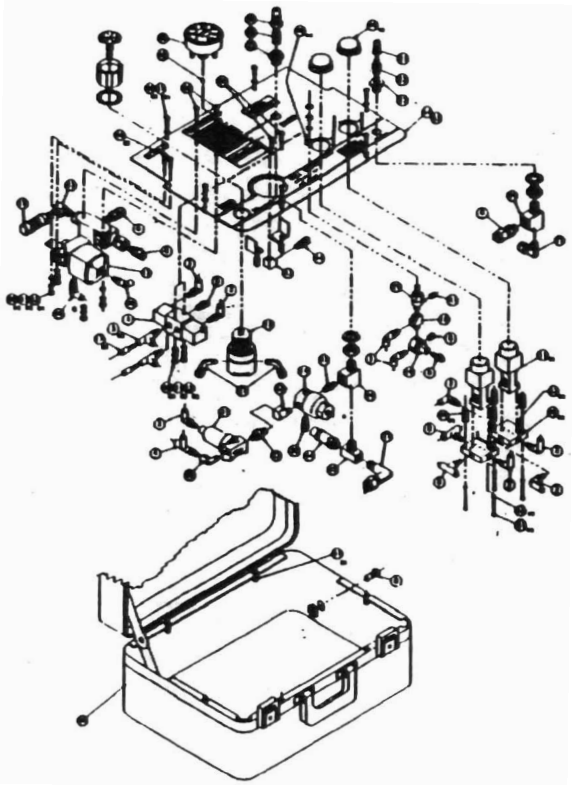
ITEM	P/N	DESCRIPTION	QTY
60	35915	DECAL, TIMER TIMES	1
59	35692	DECAL, INCREASE	1
58	35701	DECAL, INLET PRESSURE	1
57	35142	LABEL, NO PROTECTANT	1
56	35914	DECAL, INSTRUCTIONS	1
55	32206	DECAL, SERIAL NUMBER	1
54	35487	NUT, REG PANEL MOUNT	1
53	35556	EXPANSION PIN, 1/8" X 1/4" STAINLESS STEEL	2
52	34841	WASHER, LOCK #8-32	4
51	34848	SCREW, SOCKET HEAD #8-32 X 1 1/2"	4
50	34849	NUT, THREADED SPACER #8-32 HEX	4
49	34838	SCREW, TRUSS STAINLESS STEEL #8-32	4
48	34352	WASHER, NATURAL NYLON	8
47	34381	SCREW, PHILLIPS TRS #10-32 X 3/4"	8
46	35776	CAP, WATER TIGHT	2
45	35265	OVERLAY, 3013C	1
44	35264	SUB-PLATE, 3013C	1
43	35296	RIVET, BLIND #10-32	6
42	35275	CASE, M/P 6 5"	1
41	36094	REGULATOR, 90 PSI PRESET	1
40	35012	NIPPLE, 1/8" MPT HEX	1
39	34829	TEE, 5/32" T X 1/8" MPT	1
38	35557	PLUG, 1/8" MPT HEX	2
37	36091	CONNECTOR, 5/32" T-Y	1
36			
35	35024	PLUG, #10-32, 468-2 BRASS	8
34	35605	MANIFOLD, BASE	1
33	35543	TIMER, PRT C-10 (DISCHARGE)	1
32	35565	ORIFICE #53 GAUGE	1

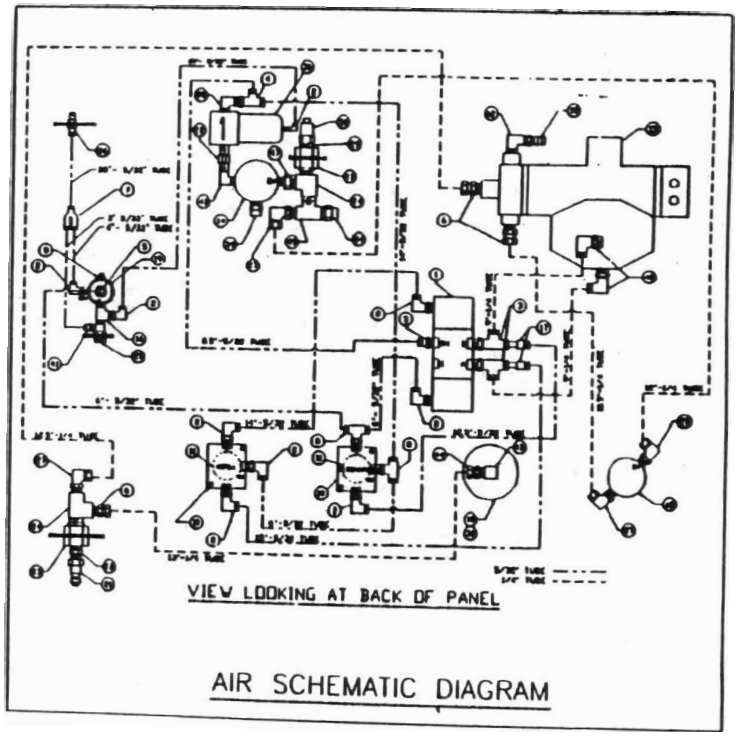
Q.E.D.
ENVIRONMENTAL SYSTEMS INC
6005 JACKSON RD.
ANN ARBOR, MICH

JV 26MAR92 | DHE 26MAR92 | L.N. 26MAR92

TITLE PARTS LIST
3013 CONTROLLER
3013-4 REV -
SHEET 4 OF 4

3013H Controller





AIR SCHEMATIC DIAGRAM

3013H Controller (continued)

ITEM	P/N	DESCRIPTION	QTY
35	34149	ELBOW STREET 1/8" BRASS	2
34	34158	VALVE, RELIEF 300 PSI	1
33	34944	TUBING 1/4"OD PARFLEX	1'
32	34943	TUBING 5/32"OD PARFLEX	95'
31	35350	FILTER, 5 MIC POLYCAR	1
30	34233	GAUGE, PRESSURE CONTROL HP, 300 PSI	1
29	34109	NIPPLE, 1/4" MPT, BRASS	1
28	34486	TUBING, 1/4" NYLON NATURAL	4'
27	34505	ELBOW, 1/4"T X 1/4" MPT SWAGELOCK	4
26	36692	BULKHEAD, 5/32" T X T	1
25	34185	VALVE, 2-WAY PUSH	1
24	34104	TEE, STREET 1/4" BRASS	2
23	34108	ANCHOR, 1/4" FPT	2
22	34532	NIPPLE, 1/8" MPT X 1/4" MPT HEX	1
21	34642	NIPPLE, SERIES 810 1/4" MPT BRASS	1
20			
19	35098	VALVE, 3-WAY NC BOOSTER	1
18	36330	PLUG, GAGE THROTTLE	1
17	34928	REDUCER 5/32"T X 1/4"T PUSH-LOCK	2
16	34111	TEE, STREET 1/8" BRASS	1
15	34647	EXHAUST SILENCER	1
14	34946	REGULATOR 80P-2nd300P	1
13	35277	VALVE/ACTUATOR ASSEMBLY	1
12	35276	REGULATOR "GO" PRIMARY	1
11	34935	TIMER, PRI-A10	2
10	34934	SUB-BASE, TIMER	2
9	35557	PLUG, 1/8" MPT HEX	1
8	34928	TEE, 5/32" T X 1/8" MPT	2
7	36891	CONNECTOR, "T"-FEMALE 5/32"	1
6	09885	CONNECTOR, 1/4"T X 1/4" MPT BRASS SWAGELOCK	3
5	34947	CONNECTOR, 5/32"T X 1/8" MPT	2
4	34933	TEE,5/32"T X 1/8"MPT PUSH-LOCK RUN	1
3	34927	TEE,1/4"T X 1/8" MPT PUSH-LOCK RUN	2
2	34930	ELBOW, 5/32" T X 1/8" MPT	9
1	34937	VALVE, MAC	1

Q.E.D.
ENVIRONMENTAL SYSTEMS INC
6005 JACKSON RD
ANN ARBOR, MICH

JR 08APR92 | DME 08APR92 | LN 08APR92

TITLE PARTS LIST
3013H CONTROLLER
DRAWING NUMBER 3013H-3 REV.
SHEET 3 OF 4

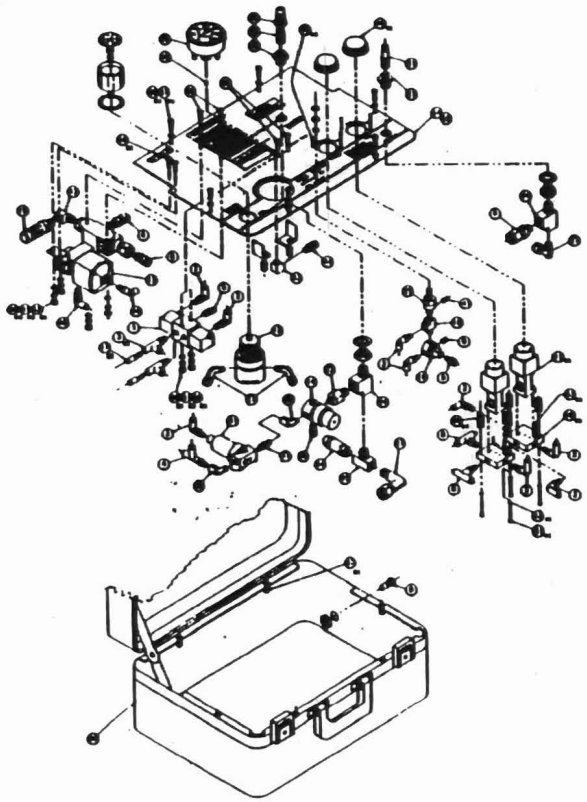
ITEM	P/N	DESCRIPTION	QTY
69	32206	DECAL, SERIAL NUMBER	1
68	35019	LABEL, WARNING -COMPRESSED GAS 300 PSI	1
67	35020	LABEL, CAUTION	1
66	35142	LABEL, NO PROTECTANT	1
65	35092	DECAL, INCREASE	1
64	35015	DECAL, TIMER TIMES	1
63	35014	DECAL, INSTRUCTIONS	1
62	34803	NUT, HEX 010-32 STAINLESS STEEL	6
61	35245	WASHER, 010 LOCK STAINLESS STEEL	6
60	35244	WASHER, 010 FLAT STAINLESS STEEL	6
59	35243	SCREW, TRUSS 010-32 X 4" STAINLESS STEEL	2
58	35841	SCREW, TRUSS 010-32 X 62" STAINLESS STEEL	4
57	35298	RIVET, BLIND #10-32	6
56	35275	CASE, H/P 6.5"	1
55	35265	OVERLAY 3013C	1
54	35274	SUB-PLATE 3013HC	1
53	35556	EXPANSION PIN, 1/8" X 1/4" STAINLESS STEEL	2
52	34841	WASHER, LOCK #8-32	4
51	34848	SCREW, SOCKET HEAD #8-32 X 1 1/2"	4
50	34848	NUT, THREADED SPACER #8-32 HEX	4
49	34838	SCREW, TRUSS STAINLESS STEEL #8-32	4
48			
47	35012	NIPPLE, 1/8" MPT HEX	1
46	35778	CAP, WATER TIGHT	2
45	34125	TEE 1/8" MPT	1
44	34644	CONNECTOR,1/4" T X 1/8" MPT BRASS SWAGELOCK	1
43	34648	ELBOW, UNION 1/8" FPT	1
42	34126	ELBOW, STREET 1/4" BRASS	1
41	35465	CONNECTOR, 5/32" T X #10-32	1
40	34142	ELBOW, 1/4" T X 1/8"-MPT (LEGAL)	2
39	34189	VALVE, RELIEF 1/8" MPT 100 PSI	1
38	34625	NIPPLE,COUPLER-SERIES 60 1/4" FPT	1
37	34352	WASHER, NATURAL NYLON 010	6
36	34361	SCREW,PHILLIPS TRUSS HEAD 010 32 X 3/4"	6

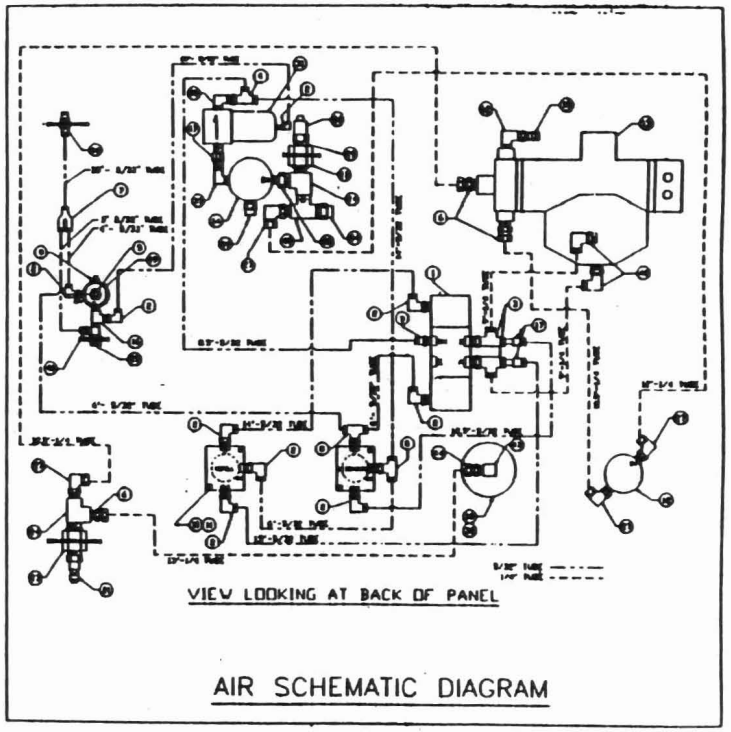
Q.E.D.
ENVIRONMENTAL SYSTEMS INC
6005 JACKSON RD
ANN ARBOR, MICH

JR 08APR92 | DME 08APR92 | LN 08APR92

TITLE PARTS LIST
3013H CONTROLLER
DRAWING NUMBER 3013H-4 REV.
SHEET 4 OF 4

3013UH Controller





AIR SCHEMATIC DIAGRAM

3013UH Controller (continued)

ITEM	P/N	DESCRIPTION	QTY
35	34148	ELBOW,STREET 1/8" BRASS	1
34	34508	VALVE, RELIEF 500 PSI 1/4" MPT	1
33	34944	TUBING 1/4"OD PARFLEX	15'
32	34943	TUBING 5/32"OD PARFLEX	85'
31	35350	FILTER, 5 MIC POLYCAR	1
30	34507	GAUGE, 0-800 PSI	1
29	34109	NIPPLE, 1/4" MPT, BRASS	1
28	34486	TUBING, 1/4" NYLON NATURAL	4'
27	34505	ELBOW, 1/4"T X 1/4" MPT SWAGELOCK	4
26	36092	BULKHEAD, 5/32" T X T	1
25	34185	VALVE, 2-WAY PUSH	1
24	34104	TEE, STREET 1/4" BRASS	2
23	34108	ANCHOR, 1/4" FPT	2
22	34532	NIPPLE, 1/8" MPT X 1/4" MPT HEX	2
21	34506	NIPPLE, COUPLER 1/8" FPT SERIES 60	1
20			
19	35096	VALVE, 3-WAY NC BOOSTER	1
18	34200	PLUG GAUGE, THROTTLE	1
17	34829	REDUCER 5/32"T X 1/4"T PUSH-LOCK	2
16	34111	TEE, STREET 1/8" BRASS	1
15	34647	EXHAUST SILENCER	1
14	34742	REGULATOR, 0-300 UH W/OUTLET PORT	1
13	35277	VALVE/ACTUATOR ASSEMBLY	1
12	35276	REGULATOR "CO" PRIMARY	1
11	34935	TIMER, PRT-A10	2
10	34934	SUB-BASE, TIMER	2
9	35557	PLUG, 1/8" MPT HEX	1
8	34829	TEE, 5/32" T X 1/8" MPT	2
7	36081	CONNECTOR, "Y"-FEMALE 5/32"	1
6	90005	CONNECTOR, 1/4"T X 1/4" MPT BRASS SWAGELOCK	3
5	34847	CONNECTOR, 5/32"T X 1/8" MPT	2
4	34833	TEE,5/32"T X 1/8"MPT PUSH-LOCK RUN	1
3	34827	TEE,1/4"T X 1/8" MPT PUSH-LOCK RUN	2
2	34830	ELBOW, 5/32" T X 1/8" MPT	8
1	34837	VALVE, MAC	1

Q.E.D.
ENVIRONMENTAL SYSTEMS INC
6005 JACKSON RD
ANN ARBOR, MICH

DRAWN BY JP	08APR92	APPROVED BY DHE	08APR92
CHECKED BY L H	08APR92	MFG APPROVAL	
		MATERIAL	
NEXT ASSY	USED ON	FINISH	SCALE

TITLE PARTS LIST
3013UH CONTROLLER
DRAWING NUMBER 3013UH-3 REV -
SHEET 3 OF 4

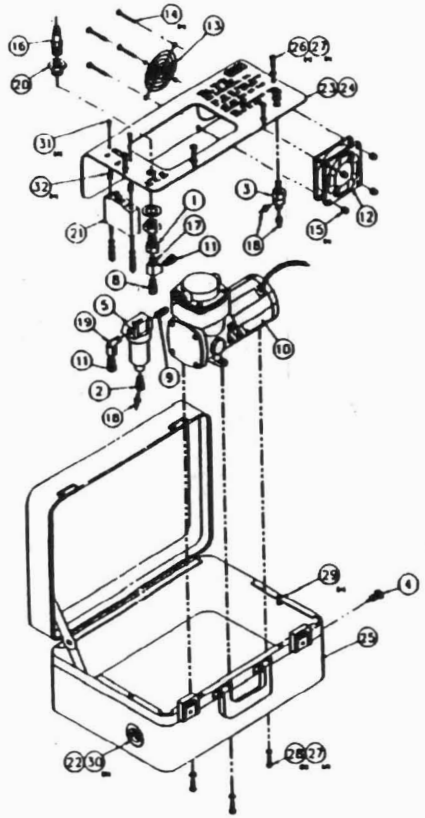
ITEM	P/N	DESCRIPTION	QTY
69	32206	DECAL, SERIAL NUMBER	1
68	35018	LABEL, WARNING -COMPRESSED GAS-500 PSI	1
67	35020	LABEL, CAUTION	1
66	35142	LABEL, NO PROTECTANT	1
65	35682	DECAL, INCREASE	1
64	35915	DECAL, TIMER TIMES	1
63	35914	DECAL, INSTRUCTIONS	1
62	34803	NUT, HEX #10-32 STAINLESS STEEL	6
61	35245	WASHER, #10 LOCK STAINLESS STEEL	6
60	35244	WASHER, #10 FLAT STAINLESS STEEL	6
59	35243	SCREW, TRUSS #10-32 X 3" STAINLESS STEEL	2
58	35041	SCREW, TRUSS #10-32 X 62" STAINLESS STEEL	4
57	35296	RIVET, BLIND #10-32	8
56	35275	CASE, H/P 6 5"	1
55	35285	OVERLAY 3013C	1
54	35274	SUB-PLATE 3013UHC	1
53	35556	EXPANSION PIN, 1/8" X 1/4" STAINLESS STEEL	2
52	34841	WASHER, LOCK #8-32	4
51	34948	SCREW, SOCKET HEAD #8-32 X 1 1/2"	4
50	34949	NUT, THREADED SPACER #8-32 HEX	4
49	34938	SCREW, TRUSS STAINLESS STEEL #8-32	4
48			
47	34105	NIPPLE, 1/4" MPT HEX	1
46	35776	CAP, WATER TIGHT	2
45	34125	TEE 1/4" MPT	1
44	34844	CONNECTOR,1/4" T X 1/8" MPT BRASS SWAGELOCK	1
43	34848	ELBOW, UNION 1/8" FPT	1
42	34126	ELBOW, STREET 1/4" BRASS	2
41	35485	CONNECTOR, 5/32" T X #10-32	1
40	34142	ELBOW, 1/4" T X 1/8" MPT (LEGRIS)	2
39	34154	VALVE, RELIEF 1/4" MPT 50-150 PSI	1
38	34625	NIPPLE,COUPLER-SERIES 60 1/4" FPT	1
37	34352	WASHER, NATURAL NYLON #10	8
36	34381	SCREW,PHILLIPS TRUSS HEAD #10-32 X 3/4"	8

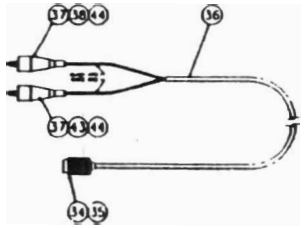
Q.E.D.
ENVIRONMENTAL SYSTEMS INC
6005 JACKSON RD
ANN ARBOR, MICH

DRAWN BY JP	08APR92	APPROVED BY DHE	08APR92
CHECKED BY L H	08APR92	MFG APPROVAL	
		MATERIAL	
NEXT ASSY	USED ON	FINISH	SCALE

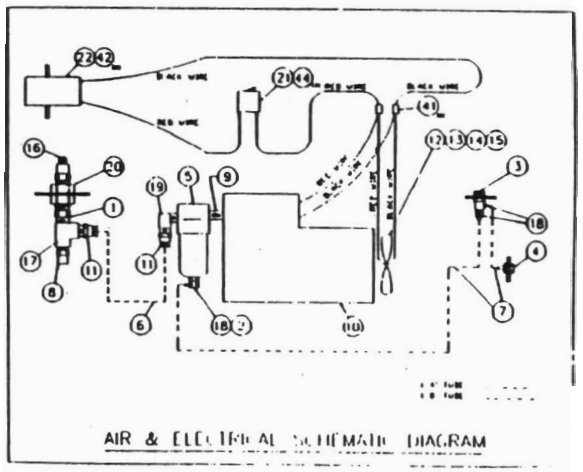
TITLE PARTS LIST
3013UH CONTROLLER
DRAWING NUMBER 3013UH-4 REV -
SHEET 4 OF 4

3020 Compressor





POWER CORD 12V DC ASSEMBLY
SUB-ASS'Y # 36416



AIR & ELECTRICAL SCHEMATIC DIAGRAM

3020 Compressor (continued)

ITEM	P/N	DESCRIPTION	QTY
31	35443	SCREW, TRUSS #6-32 X 1/2"L	2
30	34542	RIVET 1/8" X 3/8"L ALUMINUM	2
29	35298	RIVET, BLIND #10-32	4
28	34543	SCREW, RD #8-32 X 3/4"L STAINLESS STEEL	3
27	34352	WASHER, NATURAL NYLON	7
26	34361	SCREW; PHILLIPS TRS #10-32 X 3/4"L	4
25	35490	CASE.350	1
24	35758	OVERLAY, 3020	1
23	35758	SUBPLATE, 3020	1
22	34172	CONNECTOR, 2" SOCKET	1
21	34302	BREAKER, CIRCUIT 20 AMP	1
20	34108	ANCHOR 1/4" FPT	1
19	34149	ELBOW, STREET 1/8" BRASS	1
18	35004	CONNECTOR, #10-32 X 1/8"	3
17	34111	TEE, STREET 1/8" BRASS	1
16	34119	NIPPLE COUPLER, SERIES 30 1/4" MPT	1
15	34377	NUT, LOCK #8-32	4
14	35672	SCREW #8-32 X 1 1/2"L	4
13	35424	GUARD, FAN	1
12	35673	FAN, MINI 12VDC	1
11	34143	CONNECT, 1/4"T X 1/8" MPT	2
10	61007	COMPRESSOR, THOMAS	1
9	34135	NIPPLE; 1/8" MPT	1
8	34188	VALVE, RELIEF	1
7	35003	TUBING, 1/8" POLYURETHANE	1.5'
6	34944	TUBING, 1/4" BLACK NYLON	8.5'
5	35350	FILTER, 5 MICRON	1
4	34131	ANCHOR, DUAL BARB	1
3	34185	VALVE, 2-WAY PUSH	1
2	34212	CONNECT, ELBOW	1
1	34103	BUSHING, 1/4" MPT X 1/8" FPT	1

Q E D. ENVIRONMENTAL SYSTEMS INC 8095 JACKSON RD ANN ARBOR, MICH	JV 11MAY92	DHE 11MAY92	TITLE PARTS LIST 3020 COMPRESSOR
	L N 11MAY92		DRAWING NUMBER 3020-3 REV.
			SCALE — SHEET 3 OF 4

ITEM	P/N	DESCRIPTION	QTY
46	85018	3020 O & I INSTRUCTION	1
45	32206	DECAL, SERIAL NUMBER	1
44	35429	TERMINAL, FORK	4
43	34537	INSULATOR, VINYL, RED	1
42	34319	TERMINAL, RING	2
41	34318	SPLICE, BUTT #14	2
40	34317	WIRE, STRANDED, #16AWG, RED	15'
39	34316	WIRE, STRANDED, #16AWG, BLACK	1'
38	34315	INSULATOR, VINYL, BLACK	1
37	34313	CLAMP, BATTERY	2
36	34312	CABLE 14-2 SJ	15'
35	34178	COVER, "SEAL TITE"	1
34	34177	CONNECTOR-2 PLUG	1
33	34122	COUPLER, SERIES 30 1/4" FPT	1
32	34354	WASHER #10 BRASS	4

Q E D. ENVIRONMENTAL SYSTEMS INC 8095 JACKSON RD ANN ARBOR, MICH	JV 11MAY92	DHE 11MAY92	TITLE PARTS LIST 3020 COMPRESSOR
	L N 11MAY92		DRAWING NUMBER 3020-4 REV.
			SCALE — SHEET 4 OF 4

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APPENDIX D
WELL WIZARD WARRANTY

Q.E.D. Environmental systems, Inc. (QED) warrants to the original purchaser of its products that, subject to the limitations and conditions provided below, the products, materials, and/or workmanship shall reasonably conform to descriptions of the products and shall be free of defects in materials and workmanship. Any failure of the products to conform to this warranty will be remedied by QED in the manner provided herein.

Limits and Conditions

This warranty shall be limited to the duration and the conditions set forth below. All warranty durations are calculated from the original date of purchase.

1. **Dedicated-Use Systems Products**–10-year warranty on dedicated bladder pumps equipped with QED inlet screens, and purge pumps used in periodic, non-continuous ground water sampling (up to 52 sampling events per year). All other components, equipment, and accessories are warranted for 1 year.
2. **Portable-Use Systems**–Controllers and Water-Level Meters are warranted for 1 year. Hose reels, Pumps, and Caps are warranted for 90 days. Tubing and Purge Mizers are covered by a 90-day material and workmanship warranty. There will be no warranty for application on Tubing and Purge Mizers when used as part of a Portable System.

3. **Separately Sold Parts and Spare Parts Kits–Separately sold parts and spare parts kits are warranted for 90 days. Repairs performed by QED are warranted for 90 days from date of repair or for the full term of the original warranty, whichever is longer.**

Remedy

Buyers' exclusive remedy for breach of said warranty shall be as follows: if, and only if, QED is notified in writing within the applicable warranty period of the existence of any such defect in the said products, and QED upon examination of any such defects, shall find the same to be within the term of and covered by the warranty running from QED to Buyer, QED will, at its option, as soon as reasonably possible, replace or repair any such product, without charge to Buyer. If QED for any reason, cannot repair a product covered hereby within 4 weeks after receipt of the original Purchaser's/Buyer's notification of a warranty claim, then QED's sole responsibility shall be, at its option, either to replace the defective product with a comparable new unit at no charge to the Buyer, or to refund the full purchase price. In no event shall such allegedly defective products be returned to QED without its consent, and QED's obligations of repair, replacement, or refund are conditioned upon the Buyer's return of the defective product to QED.

IN NO EVENT SHALL QED ENVIRONMENTAL SYSTEMS, INC. BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF SAID WARRANTY.

Exclusions

The foregoing warranty does not apply to major sub-assemblies and other equipment, accessories, and parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties, if any, supplied by the respective manufacturers. QED makes no warranty concerning products or accessories not manufactured by QED. In the event of failure of any such product accessory, QED will give reasonable assistance to Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

Applicability

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY (INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY, and of any other obligations or liabilities on the part of QED, and QED neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the said products, materials, and/or workmanship.

Liability Limits

It is understood and agreed that QED shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application.

This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use, or exposure to chemical or physical environment beyond the designated limits of materials and construction will also void this warranty. QED shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED's service personnel unless such repair by others is made with the written consent of QED.

Defective Product

If any product covered hereby is actually defective within the terms of this warranty, Purchaser must contact QED for determination of warranty coverage. If the return of a component is determined to be necessary, QED will authorize the return of the component, at owner's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts, and labor as authorized by owner hereunder shall be borne by the purchaser.

Responsibility of the Purchaser

The original Purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. You may secure performance of obligations hereunder by contacting the Customer Service Department of QED and:

1. Identifying the product involved (by model or serial number or other sufficient description that will allow QED to determine which product is defective.)
2. Specifying where, when, and from whom the product was purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.
4. Sending the malfunctioning component, after authorization by QED, to:

   Q.E.D. Environmental Systems, Inc.
   6155 Jackson Road
   Ann Arbor, Michigan 48103
   Attention: Return Authorization Code ____
   (800) 624-2026 (313)995-2547

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Attachment G

Sample Container and Preservation Procedures

Attachment G
Handling Requirements Monitoring Parameters

Parameter	Perservation	Holding Time	Bottle Type	Minimum Volume
Total Phenolics	1,2	28 Days	Amber Glass	0.5 L
Sulfate	2	28 Days	Plastic	50 ml*
Total Alkalinity	2	14 Days	Plastic	100 ml*
Fluoride	2	28 Days	Plastic	300 ml*
Chloride	2	28 Days	Plastic	50 ml*
Nitrate/Nitrite	1,2	48 Hrs	Plastic	0.5 L
Arsenic	3,5	6 Mos	Plastic	200 ml**
Cadmium	3,5	6 Mos	Plastic	200 ml**
Calcium	3,5	6 Mos	Plastic	200 ml**
Chromium	3,5	6 Mos	Plastic	200 ml**
Iron	3,5	6 Mos	Plastic	200 ml**
Potassium	3,5	6 Mos	Plastic	200 ml**
Lead	3,5	6 Mos	Plastic	200 ml**
Magnesium	2,3,5	6 Mos	Plastic	200 ml**
Manganese	2,3,5	6 Mos	Plastic	200 ml**
Molybdenum	2,3,5	6 Mos	Plastic	200 ml**
Nickel	2,3,5	6 Mos	Plastic	200 ml**
Sodium	3,5	6 Mos	Plastic	200 ml**
Zinc	3,5	6 Mos	Plastic	200 ml**
Cyanide	2,4	14 Days	Plastic	500 ml
Copper	3,5	6 Mos	Plastic	200 ml**
pH		Immediate	Plastic	25 ml
Bicarbonate	2	14 Days	Plastic	100 ml*
Carbonate	2	14 Days	Plastic	100 ml*
TOC	2,7	28 Days	Glass	100 ml
Specific Conductivity	2	28 Days	Plastic	100 ml
Volatile Organics	2,6	14 Days	Glass	2x40 ml
PCBs	2	7 Days Ext. 40 after Ext.	Amber Glass	1000 ml

1) pH<2 with concentrated Sulfuric Acid
2) Store at 4 degrees Centigrade
3) pH<2 with nitric acid
4) pH>12 with sodium hydroxide
5) Filtered in the field using 0.45 micron membrane filters on the time of collection
6) 4 drops HCL, no headspace
7) pH<2 with hydrochloric acid

* Note: One liter for all of these parameters stored similarily
** Note: One liter for all of these parameters stored similarily

Attachment H

Ground Water Monitoring Parameter List

Ground Water Monitoring Parameter List

A. Primary Parameters

Benzene	1,2 Dichlorobenzene	Xylene
1,2 Dichloroethane	1,2 Dichloroethene	Ethylbenzene
Methylene Chloride	Toluene	Trichloroethene
1,1,1 Trichloroethane	Vinyl Chloride	1,1 Dichloroethane
1,4 -Dioxane		
PCB-1016[1]	**PCB-1221**[1]	**PCB-1231**[1]
PCB-1242[1]	**PCB-1248**[1]	**PCB-1254**[1]
PCB-1260[1]		

B. Secondary Parameters

Potassium	Sodium	Nickel
Chromium(t)	Lead	Molybdenum
Sulfate	Chloride	Bicarbonate
Carbonate	Arsenic	Cyanide[4]
Nitrate	Nitrite	Fluoride
Total Phenolics	Total Organic Carbon	Iron

C. Tertiary Parameters

Calcium[2]	Magnesium[2]	Copper[2]
Manganese[2]	Zinc[2]	Cadmium[2]

D. Field Monitoring Parameters[3]

Specific Conductance	Temperature	pH

Notes:

1	PCB's to be analyzed in samples from wells OB-21, OB-23, OB-24, OB-40R and OB-48 through OB-53.
2	Tertiary parameter that will be measured during detection monitoring.
3.	Parameter to be measured in field for all samples collected
4.	Amenable cyanide to be analyzed if cyanide is detected

Attachment I

Analytical Methods and Target Detection Limits

Attachment I
Analytical Methods and Target Detection Limits

VOC Parameter	Detection Limit (mg/l)	Preparation Method	Analytical Method
1,1-Dichloroethane	0.001	---	EPA 8260B
1,2-Dichloroethane	0.001	---	EPA 8260B
1,2-Dichloroethene	0.001	---	EPA 8260B
1,1,1-Trichloroethane	0.001	---	EPA 8260B
Trichloroethene	0.001	---	EPA 8260B
Vinyl Chloride	0.001	---	EPA 8260B
Methylene Chloride	0.005	---	EPA 8260B
1,2-Dichlorobenzene	0.001	---	EPA 8260B
Benzene	0.001	---	EPA 8260B
Toluene	0.001	---	EPA 8260B
Ethylbenzene	0.001	---	EPA 8260B
Xylenes (Total)	0.003	---	EPA 8260B
Indicator Parameter	**Detection Limit (mg/l)**	**Preparation Method**	**Analytical Method**
Alkalinity (Total)	10	---	2320B
Bicarbonate Alkalinity	10	---	2320B
Carbonate Alkalinity	10	---	2320B
Chloride	1	---	SM 4500-Cl E-11
Cyanide (Total)	0.005	EPA 9014	EPA 9014
Fluoride	0.1	---	SM 4500-F C-11
Nitrate/Nitrite	0.01	---	SM 4500-NO3 F-11
pH	N/A	---	SM 4500-H B-11
Phenolics (Total)	0.01	EPA 420.4	EPA 420.4
Specific Conductivity	5(mmhos/cm)	---	SM 2510B-11
Sulfate	2	---	SM 4500-SO4 E-11
TOC	0.5	---	SM 5310C-11
Metals	**Detection Limit (mg/l)**	**Preparation Method**	**Analytical Method**
Arsenic	0.001	EPA 3020A	EPA 6020A
Cadmium	0.0002	EPA 3020A	EPA 6020A
Calcium	1	EPA 3010A	EPA 6010C
Chromium	0.02	EPA 3020A	EPA 6020A
Copper	0.01	EPA 3020A	EPA 6020A
Iron	0.02	EPA 3010A	EPA 6010C
Lead	0.001	EPA 3010A	EPA 6010C
Magnesium	1	EPA 3020A	EPA 6020A
Manganese	0.005	EPA 3020A	EPA 6020A
Molybdenum	0.025	EPA 3020A	EPA 6020A
Nickel	0.025	EPA 3010A	EPA 6010C
Potassium	0.1	EPA 3010A	EPA 6010C
Sodium	1	EPA 3010A	EPA 6010C
Zinc	0.01	EPA 3020A	EPA 6020A
PCB	**Detection Limit (mg/l)**	**Preparation Method**	**Analytical Method**
PCB-1016	0.0001	EPA 3510C	8082A
PCB-1221	0.0001	EPA 3510C	8082A
PCB-1232	0.0001	EPA 3510C	8082A
PCB-1242	0.0001	EPA 3510C	8082A
PCB-1248	0.0001	EPA 3510C	8082A
PCB-1254	0.0001	EPA 3510C	8082A
PCB-1260	0.0001	EPA 3510C	8082A

Attachment J

Field Measurement Equipment and Procedures
Yellow Springs Instrument Co (YSI) Equipments Instructions
(pH, specific conductivity & temperature)

Pro1030



USER MANUAL

English

YSI®

a xylem brand

Item #605182
Rev A, January 2013
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WARRANTY

The YSI Professional 1030 instrument (Pro1030) is warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship, exclusive of batteries and any damage caused by defective batteries. Pro1030 cable assemblies are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. Pro1030 pH and ORP sensors are warranted for one (1) year from date of purchase by the end user against defects in material and workmanship. Pro1030 instruments, cables & sensors are warranted for one (1) year from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937 767-7241, 800-897-4151 or visit www.YSI.com for a Product Return Form. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

1. Failure to install, operate or use the product in accordance with YSI's written instructions;
2. Abuse or misuse of the product;
3. Failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
4. Any improper repairs to the product;
5. Use by you of defective or improper components or parts in servicing or repairing the product;
6. Modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

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INTRODUCTION

Thank you for purchasing the YSI Pro1030, an instrument from the YSI *Professional Series* product family. The Pro1030 measures conductivity, temperature and either pH or ORP in water. The Pro1030 features an impact resistant and waterproof (IP-67) case, a rugged MS-8 (military-spec) cable connector, backlit display, user-selectable sensor options, 50 data set memory and a rubber over-mold case.

The Pro1030 provides valuable instructions and prompts near the bottom of the display that will guide you through operation and use; however, reading the entire manual is recommended for a better understanding of the instrument's features.

> *The Pro1030 cannot communicate to a PC via a ProComm communications saddle.*

GETTING STARTED

INITIAL INSPECTION

Carefully unpack the instrument and accessories and inspect for damage. Compare received parts with items on the packing list. If any parts or materials are damaged or missing, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

BATTERY INSTALLATION

The instrument requires 2 alkaline C-cell batteries. Under normal conditions, the average battery life is 425 hours at room temperature without using the back light. A battery symbol  will blink in the lower, left corner of the display to indicate low batteries when approximately 1 hour of battery life remains.

To install or replace the batteries:

1. Turn the instrument off and flip over to view the battery cover on the back.
2. Unscrew the four captive battery cover screws.
3. Remove the battery cover and remove the old batteries if necessary.

4. Install the new batteries, ensuring correct polarity alignment (figure 1).
5. Place the battery cover on the back of the instrument and tighten the four screws. Do not over-tighten.

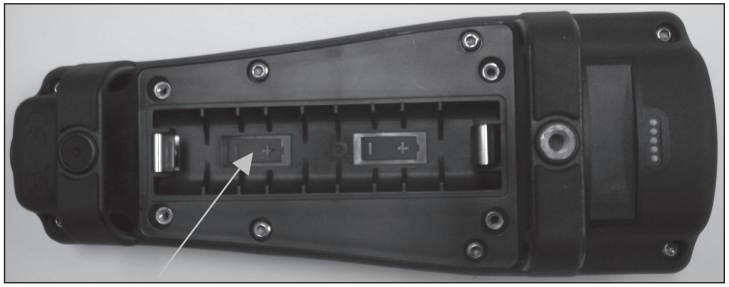


Figure 1. Pro1030 with battery cover removed. Notice battery symbols indicating polarities.

> *The waterproof instrument case is sealed at the factory and is not to be opened, except by factory-authorized service technicians. Do not attempt to separate the two halves of the instrument case as this may damage the instrument, break the waterproof seal, and will void the warranty.*

KEY PAD

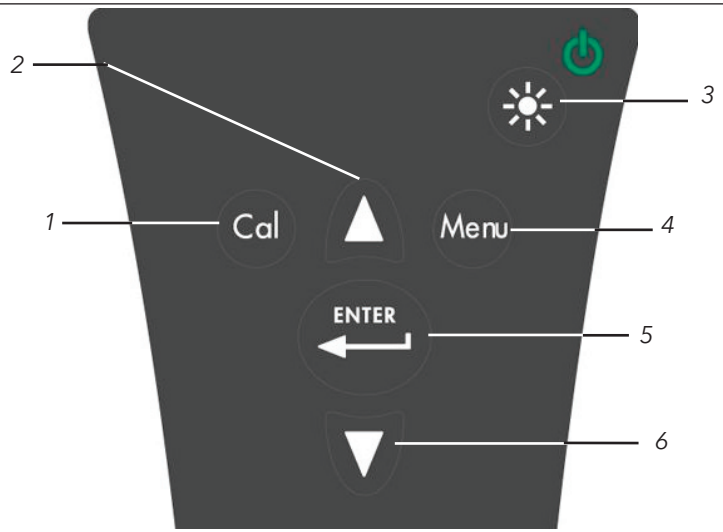


Figure 2, Keypad

Number	*Key*	*Description*
1	Cal	**Calibrate** Press and hold for 3 seconds to calibrate. Opens Calibrate menu from the Run screen.
2		**Up Arrow** Use to navigate through menus, to navigate through box options along the bottom of the Run screen and to increase numerical inputs.
3		**Power and Backlight** Press once to turn instrument on. Press a second time to turn backlight on. Press a third time to turn backlight off. Press and hold for 3 seconds to turn instrument off.
4	Menu	**Menu** Press to enter the System Setup menu from the Run screen.
5	ENTER	**Enter** Press to confirm entries and selections.
6		**Down Arrow** Use to navigate through menus, to navigate through box options at the bottom of the Run screen and to decrease numerical inputs.

CONNECTING THE SENSOR AND CABLE

"Bulkhead" refers to the single-pin connector at the end of the probe/cable assembly where an ISE sensor, either pH or ORP, is installed (figure 3). The conductivity and temperature sensors are located above and next to the bulkhead and are not replaceable.

When an ISE sensor is not installed in the cable, the bulkhead connector is not water-proof. Do not submerge the cable without a sensor installed. Submerging the cable without a sensor installed may cause permanent damage to the cable that is not covered under warranty.

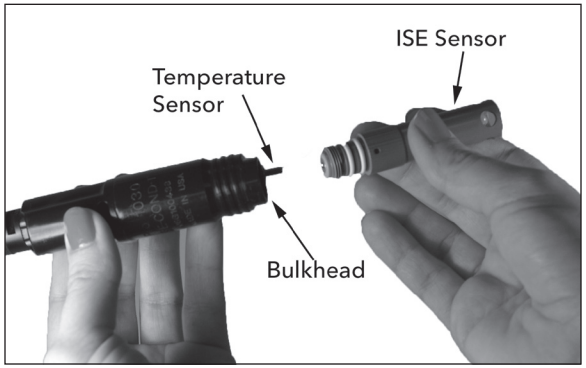


Figure 3

INSTALLING THE ISE SENSOR

The Pro1030 has three compatible ISE sensors: pH (model #1001), pH-amplified (model #1001A) and ORP (model #1002).

1. Remove the plastic plug from the cable's bulkhead port by pulling it straight out of the port. This can be discarded.
2. Remove the red plastic plug from the sensor's connector by pulling it straight off the sensor. This can be discarded.
3. Ensure both the sensor connector and bulkhead connector are clean and dry.
4. Grasp the sensor with one hand and the cable bulkhead in the other.
5. Push the sensor into the connector on the cable until it is firmly seated with only 1 o-ring visible. Failure to properly seat the sensor may result in damage.
6. Twist the sensor clockwise to engage the threads and finger tighten. Do NOT use a tool. This connection is water-tight.

The ISE sensor is shipped with the tip in a storage bottle. To remove, twist the bottle off the lid and remove the bottle from the sensor. Next, remove the o-ring and slide the lid off the sensor.

CONNECTING THE PROBE/CABLE ASSEMBLY TO THE INSTRUMENT

To connect the cable, align the keys on the cable connector to the slots on the instrument connector. Push together firmly and then twist the outer ring until it locks into place (figure 4). This connection is water-proof.



Figure 4, Note the keyed connector.

RUN SCREEN

Press the power/backlight key to turn the instrument on. The instrument will run through a self test and briefly display a splash screen with system information before displaying the main Run screen (figure 5). A language selection menu will display the first time the Pro1030 is powered on. See the First Power On section of this manual for more information.

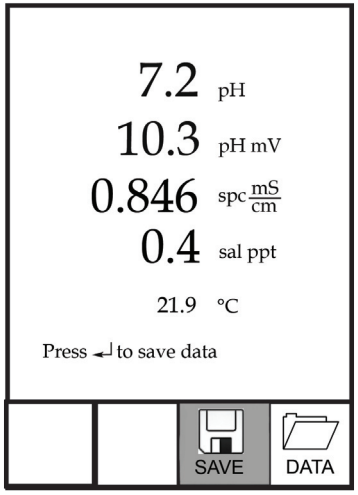


Figure 5, Run screen.

BACKLIGHT

Once the instrument is powered on, pressing the power/backlight key will turn on the display backlight. The backlight will remain on until the key is pressed again or after two minutes of not pressing any key on the keypad.

POWERING OFF

To turn the instrument off, press and hold the power/backlight key for three seconds.

NAVIGATION

The up and down arrow keys allow you to navigate through the functions of the Pro1030.

NAVIGATING THE RUN SCREEN

When in the Run screen, the up and down arrow keys will move the highlighted box along the bottom options. Once a box is highlighted, press enter to access the highlighted option.

Description of Run screen box functions from left to right:

Option	*Description*
SAVE	Highlight and press enter to save displayed data to memory.
DATA	Highlight and press enter to view and/or erase saved data.

NAVIGATING THE SYSTEM SETUP MENU

When in the System Setup menu, the up and down arrow keys will move the highlighted bar up and down the system setup options. See the System Setup menu section of this manual for more information about these options.

FIRST POWER ON

The instrument will step through an initial configuration when powered on for the first time. This will set the language. Use the up or down arrow keys to highlight the appropriate language, then press enter to confirm (figure 6).

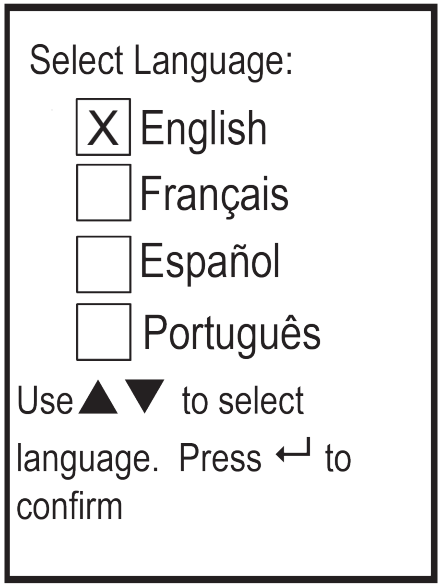


Figure 6, Select language

After selecting a language, the Run screen will be displayed. The next time the instrument is powered up, the Run screen will display immediately after the splash screen.

SYSTEM SETUP MENU

Press the menu key to access the System Setup menu. The System Setup menu contains two screens notated as 'pages'. The current page is indicated near the bottom of the display (figure 7).

Use the up and down arrow keys to scroll through menu options and menu pages.

EXITING THE SYSTEM SETUP MENU

To exit the System Setup menu, press the down arrow key until the ESC - Exit box is highlighted, then press enter to return to the Run screen.

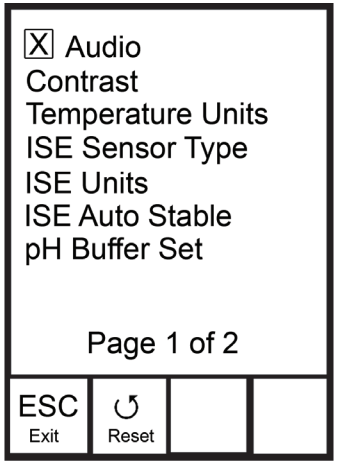


Figure 7, page 1 of System Setup menu.

AUDIO

Audio can be enabled by highlighting Audio and pressing enter. When enabled, there will be an 'X' in the box next to Audio.

When Audio is enabled, the Pro1030 will beep twice to indicate stability when Auto Stable is enabled. The instrument will also beep when a key is pressed. When Audio is disabled, the Pro1030 will not beep.

CONTRAST

To adjust the display Contrast, use the up or down arrow keys to highlight Contrast, then press enter. Next, use the up or down arrow keys to adjust the contrast. The up arrow key will darken the contrast and the down arrow key will lighten the contrast. After adjusting the contrast, press enter to save and exit the Contrast adjustment function.

ALTERNATE CONTRAST ADJUSTMENT OPTION

If necessary, there is an alternate method of adjusting the contrast. To adjust the contrast, press and hold the menu key, then press the up arrow key to darken the contrast or press the down arrow key to lighten the contrast.

TEMPERATURE UNITS

Highlight Temperature Units and press enter to open a submenu that allows you to change the temperature units displayed on the Run screen. Highlight the desired unit (Celsius or Fahrenheit) and press enter to enable. The enabled temperature unit will have an 'X' in the box next to it. Only one unit may be enabled at a time. Highlight the ESC-Exit box and press enter to save any changes and to close the Temperature Units submenu.

ISE SENSOR TYPE

ISE Sensor Type sets the type of ISE sensor being used; either pH (model #1001) or ORP (model #1002).

Use the up or down arrow keys to highlight ISE Sensor Type, then press enter to open a submenu. Highlight the sensor type corresponding to the sensor installed on the cable and press enter to confirm. The enabled sensor type will have an 'X' in the box next to it. Next, use the down arrow key to highlight the ESC – Exit, then press enter to save changes and to close the sensor submenu.

ISE UNITS

Highlight ISE Units and press enter to open a submenu that allows you to select the ISE units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled ISE unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the ISE Units submenu.

When pH is enabled in the ISE Sensor Type menu, there are two selectable measurement units: pH and pH mV. pH mV is the sensor's electrical measurement signal before being converting into pH units. pH mVs can help you determine if you are performing a good calibration and the condition of the pH electrode.

When ORP is enabled in the ISE Sensor Type menu, only ORP mVs can be enabled as the ISE unit.

AUTO STABLE

Auto Stable utilizes preset values to indicate when a reading is stable. The preset values are adjustable in the System Setup menu. The user can input a % change in measurement reading over 'x' amount of time in seconds. There are two separate Auto Stable controls, one for ISE readings (ISE Auto Stable) and one for conductivity readings (Cond. Auto Stable). ISE Auto Stable is located on the first page of the System Setup menu. Cond. Auto Stable is located on the second page of the System Setup menu.

When Auto Stable is enabled, an (AS) symbol will display next to the reading on the Run screen and blink during stabilization. When the ISE and/or conductivity reading stabilizes based on the Auto Stable settings, the (AS) symbol will display steadily and the instrument will beep twice if Audio is turned on.

ISE Auto Stable can be set to a % change of 0.0 to 9.9% over 3 to 19 seconds. The auto stable criteria is be applied to the pH measurement or the ORP mV reading depending on which sensor is enabled in the ISE Sensor menu.

Conductivity Auto Stable can be set to a % change of 0.0 to 1.9% over 3 to 19 seconds. The conductivity auto stable criteria is applied to the conductivity reading, but the AS symbol will display next to all enabled conductivity units.

To enable Auto Stable, highlight either ISE Auto Stable or Cond. Auto Stable, then press enter to open the submenu. Next, use the up or down arrow keys to highlight the % change or seconds (secs) input field, then press enter to make the highlighted field adjustable. Use the up or down arrow keys to adjust the selected value, then press enter to confirm changes. Once you have confirmed any changes, highlight the ESC-Exit box along the bottom of the display and press enter to close the Auto Stable submenu. To disable Auto Stable, set the % Change input to 0.0.

pH BUFFER SET

Highlight pH Buffer Set and press enter to open a submenu that allows you to select the Buffer Set used for auto buffer recognition during a pH calibration. There are two buffer set options: USA (4, 7 and 10) and NIST (4.01, 6.86 and 9.18). Highlight the buffer set and press enter to enable. The enabled buffer set will have an 'X' in the box next to it. Highlight the ESC-Exit box and press enter to save any changes and to close the submenu.

CONDUCTIVITY UNITS (COND. UNITS)

Highlight Cond. Units (Conductivity Units) and press enter to open a submenu that allows you to select the conductivity units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled conductivity unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the conductivity units submenu.

There are seven options for displaying conductivity. Only two units can be enabled at the same time:

- COND-mS/cm displays conductivity in milliSiemens per centimeter.
- COND-uS/cm displays conductivity in microSiemens per centimeter.
- SPC-mS/cm displays Specific Conductance in milliSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- SPC-uS/cm displays Specific Conductance in microSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- Sal ppt displays salinity in parts per thousand. The salinity reading is calculated from the instrument's conductivity and temperature values using algorithms found in *Standard Methods for the Examination of Water and Wastewater*.
- TDS g/L displays Total Dissolved Solids in grams per liter. TDS is calculated from conductivity compensated to 25°C using a user-selectable TDS constant.
- TDS mg/L displays Total Dissolved Solids in milligrams per liter. TDS is calculated from conductivity compensated to 25°C using a user-selectable TDS constant.

Note: 1 S = 1 mho.
1 milliSiemen = 1,000 microSiemens.

SPECIFIC CONDUCTANCE

The conductivity of a sample is highly dependent on temperature, varying as much as 3% for each change of one degree Celsius (temperature coefficient = 3%/°C). In addition, the temperature coefficient itself varies with the nature of the ionic species present in the sample. Therefore, it is useful to compensate for this temperature dependence in order to quickly compare conductivity readings taken at different temperatures.

The Pro1030 can display non-temperature compensated conductivity as well as temperature compensated Specific Conductance. If Specific Conductance is enabled, the Pro1030 uses the temperature and conductivity values associated with each measurement to calculate a specific conductance value that is temperature compensated based on a user-selected temperature coefficient (0 to 4%) and reference temperature (15 to 25°C).

Using the Pro1030's default reference temperature and temperature coefficient (25 °C and 1.91%), the calculation is carried out as follows:

$$\text{Specific Conductance (25°C)} = \frac{\text{Conductivity of sample}}{1 + 0.0191 * (T - 25)}$$

T = Temperature of the sample in °C

SPECIFIC CONDUCTANCE REFERENCE TEMPERATURE (SPC REF. TEMP.)

SPC Ref. Temp. (Specific Conductance Reference Temperature) is the reference temperature used to calculate Specific Conductance. The reference temperature range is 15 and 25°C. The default value is 25°C.

To change the reference temperature, highlight SPC Ref. Temp. and press enter to open the submenu. With the reference temperature highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new reference temperature. Next, highlight the ESC-Exit box and press enter to close the submenu.

SPECIFIC CONDUCTANCE TEMPERATURE COEFFICIENT (SPC %/°C)

SPC %/°C (Specific Conductance Temperature Coefficient) is the temperature coefficient used to calculate Specific Conductance. The coefficient range is 0.00 to 4.00. The default value is 1.91% which is based on KCl standards.

To change the temperature coefficient, highlight SPC %/°C and press enter to open the submenu. With the temperature coefficient highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new coefficient. Next, highlight the ESC-Exit box and press enter to close the submenu.

TDS CONSTANT

TDS Constant is a multiplier used to calculate an estimated TDS (Total Dissolved Solids) value from conductivity. The multiplier is used to convert Specific Conductance in mS/cm to TDS in g/L. The Pro1030's default value is 0.65. This multiplier is highly dependent on the nature of the ionic species present in the water sample. To be assured of moderate accuracy for the conversion, you must determine a multiplier

for the water at your sampling site. Use the following procedure to determine the multiplier for a specific sample:

1. Determine the specific conductance of a water sample from the site;
2. Filter a sample of water from the site;
3. Completely evaporate the water from a carefully measured volume of the filtered sample to yield a dry solid;
4. Accurately weigh the remaining solid;
5. Divide the weight of the solid (in grams) by the volume of water used (in liters) to yield the TDS value in g/L for this site;
6. Divide the TDS value in g/L by the specific conductance of the water in mS/cm to yield the conversion multiplier. Be certain to use the correct units.

If the nature of the ionic species at the site changes between sampling studies, the TDS values will be in error. TDS cannot be calculated accurately from specific conductance unless the make-up of the chemical species in the water remains constant.

To change the TDS Constant in the Pro1030, highlight TDS Constant and press enter to open the submenu. With the TDS Constant highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. The input range is 0.30 to 1.00. Press enter to save the new TDS Constant. Next, highlight the ESC-Exit box and press enter to close the submenu.

LANGUAGE

Highlight Language and press enter to open a submenu that allows you to change the language. Highlight the desired language (English, Spanish, Portuguese, or French) and press enter to enable. The enabled language will have an 'X' in the box next to it. Highlight ESC-Exit box and press enter to save any changes and to close the Language submenu.

The text in the boxes along the bottom of the Run screen will always be displayed in English regardless of the language enabled in the System Setup menu.

AUTO SHUTOFF

Auto Shutoff allows you to set the instrument to turn off automatically after a period of time. In the setup menu, use the up or down arrow keys to highlight Auto Shutoff, then press enter to open the submenu. Press enter while the minute field is highlighted to make it adjustable.

Next, use the up or down arrow keys to adjust the shut off time from 0 to 60 minutes. Press enter to save the new shutoff time. Next, highlight the ESC-Exit box and press enter to close the submenu.

To disable Auto Shutoff, set the Time in Minutes to 0 (zero).

CELL CONSTANT

The Cell Constant displays the cell constant of the conductivity cell. The cell constant is calculated and updated each time a conductivity calibration is performed. The cell constant range is 4.0 to 6.0. Resetting the System Menu resets the cell constant to 5.0.

RESETTING THE SYSTEM SETUP MENU AND CELL CONSTANT TO FACTORY DEFAULT

To reset the Pro1030 settings and conductivity cell constant back to factory default, press the down arrow key while in the System Setup menu until the Reset - ↺ box is highlighted, then press enter. The instrument will prompt you to confirm the reset. Highlight Yes and press enter to continue with the reset or highlight No and press enter to cancel the reset. A Factory Reset will not affect data saved in the instrument's memory.

The following will be set in the Pro1030 after performing a reset:

Parameter	*Reset Defaults*
Audio	On
Contrast	Set to mid range
Temperature Units	°C
ISE Sensor Type	pH
ISE Units	pH
ISE Auto Stable	Off (0.0 % Change and 10 seconds)
pH Buffer Set	USA
Conductivity Units	*cond mS/cm and spc mS/cm*

Parameter	*Reset Defaults*
Conductivity Auto Stable	Off (0.0 % Change and 10 seconds)
SPC Reference Temperature	*25°C*
SPC Temperature Coefficient	*1.91%/°C*
TDS Constant	*0.65*
Language	English
Auto Shutoff	30 minutes
Conductivity Cell Constant	5.0
pH Calibration	Factory default

CALIBRATION

TEMPERATURE

All Pro1030 cables have built-in temperature sensors. Temperature calibration is not required nor is it available.

pH CALIBRATION

The Pro1030 pH sensor can be calibrated by performing a 1, 2 or 3-point calibration. At least one of the calibration points must be done with pH buffer 7 or 6.86. For auto buffer recognition to work properly with an older or dirty sensor, calibrate in buffer 7 or 6.86 first. For highest accuracy, use fresh, traceable pH buffers and ensure the sensor and calibration vessel are clean.

1-POINT CALIBRATION

1. Place the sensor in pH buffer 7 or 6.86 and allow the temperature and pH readings to stabilize.
2. Press and hold Cal (Cal) for three seconds.
3. Highlight pH and press enter. If pH is not listed as an option, check the System Setup menu to ensure pH is enabled in the ISE Sensor Type menu.
4. Highlight 1 point and press enter.
5. If necessary, use the up and down arrow keys to adjust the pH buffer value. Note the pH mV reading which ideally should be between -50 and +50 in buffer 7.
6. Press enter to complete the calibration or press Cal (Cal) to cancel.

7. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
8. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

2-POINT CALIBRATION

1. Place the sensor in pH buffer 7 or 6.86 and allow the temperature and pH readings to stabilize.
2. Press and hold Cal for three seconds.
3. Highlight pH and press enter. If pH is not listed as an option, check the System Setup menu to ensure pH is enabled in the ISE Sensor Type menu.
4. Highlight 2 point and press enter.
5. If necessary, use the up and down arrow keys to adjust the pH buffer value. Note the pH mV reading which ideally should be between -50 and +50 in buffer 7.
6. Press enter to continue to second point.
7. Rinse the sensor and place it in the second pH buffer (4/4.01 or 10/9.18).
8. If necessary, use the up and down arrow keys to adjust the pH buffer value.
9. Wait approximately 30 to 60 seconds for the pH sensor to stabilize and for the temperature reading to stabilize. Note the pH mV reading. pH mVs in buffer 4 should be +159 to 180 mV from the previous buffer 7 pH mV value. pH mVs in buffer 10 should be -159 to 180 mV from the previous buffer 7 pH mV value.
10. Press enter to complete the calibration or press Cal to cancel.
11. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
12. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

3-POINT CALIBRATION

1. Place the sensor in pH buffer 7 or 6.86 and allow the temperature and pH readings to stabilize.
2. Press and hold Cal for three seconds.

3. Highlight pH and press enter. If pH is not listed as an option, check the System Setup menu to ensure pH is enabled in the ISE Sensor Type menu.
4. Highlight 3 point and press enter.
5. If necessary, use the up and down arrow keys to adjust the pH buffer value. Note the pH mV reading which should be between -50 and +50 in buffer 7.
6. Press enter to continue to second point.
7. Rinse the sensor and place it in the second pH buffer (4/4.01 or 10/9.18). If necessary, use the up and down arrow keys to adjust the pH buffer value.
8. Wait approximately 30 to 60 seconds for the pH sensor to stabilize and for the temperature reading to stabilize. Note the pH mV reading. pH mVs in buffer 4 should be +159 to 180 mV from the previous buffer 7 pH mV value. pH mVs in buffer 10 should be -159 to 180 mV from the previous buffer 7 pH mV value.
9. Rinse the sensor and place it in the third pH buffer (4/4.01 or 10/9.18). If necessary, use the up and down arrow keys to adjust the pH buffer value.
10. Wait approximately 30 to 60 seconds for the pH sensor to stabilize and for the temperature reading to stabilize. Note the pH mV reading. pH mVs in buffer 4 should be +159 to 180 mV from the previous buffer 7 pH mV value. pH mVs in buffer 10 should be -159 to 180 mV from the previous buffer 7 pH mV value.
11. Press enter to complete the calibration or press Cal to cancel.
12. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
13. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

ORP CALIBRATION

1. Place the clean sensor in ORP calibration solution. Wait for the ORP and temperature readings to stabilize.
2. Press and hold Cal for three seconds.
3. Highlight ORP and press enter. If ORP is not listed as an option, check the System Setup menu to ensure ORP is enabled in the ISE Sensor Type menu.
4. Use the up and down arrow keys to adjust the ORP calibration solution value.

5. Wait for the temperature reading to stabilize, then press enter to complete the calibration or press Cal (Cal) to cancel.
6. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
7. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

CONDUCTIVITY CALIBRATION

Ensure the conductivity sensor is clean and dry before performing a conductivity, specific conductance or salinity calibration.

It is not necessary to calibrate conductivity, specific conductance and salinity. Calibrating one of these parameters will simultaneously calibrate the others. YSI recommends calibrating specific conductance for greatest ease.

Always calibrate with fresh, traceable calibration solution with a value of 1000 uS or more.

Note: 1 mS = 1000 uS

CALIBRATING SPECIFIC CONDUCTANCE (SPC) OR CONDUCTIVITY

Note: When calibrating Specific Conductance, the Pro1030 uses the factory default values for the Specific Conductance Reference Temperature and the Specific Conductance Temperature Coefficient regardless of what is configured in the System Setup Menu. The default value for the Reference Temperature is 25°C and the default value for the Temperature Coefficient is 1.91%/°C. It is important to note that the Temperature Coefficient of a calibration solution is dependent on the contents of the solution. Therefore, for highest accuracy, YSI recommends using a traceable calibration solution made of KCl (potassium chloride) when calibrating Specific Conductance since these solutions typically have a Temperature Coefficient of 1.91%/°C. Additionally, be sure to enter the value of the solution as it is listed for 25°C when calibrating Specific Conductance.

1. Place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable

(figure 8). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.

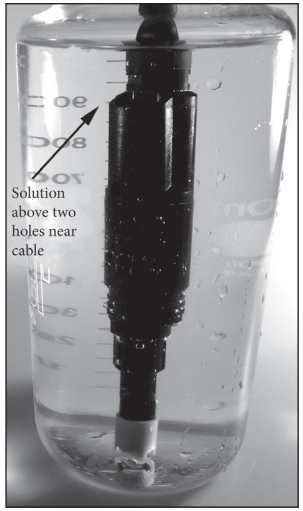


Figure 8, solution above two holes near cable.

2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight the desired calibration method, Sp. Conductance or Conductivity, and press enter.
3. Highlight the units you wish to calibrate, either uS/cm or mS/cm, and press enter. 1 mS = 1,000 uS.
4. Use the up or down arrow key to adjust the value on the display to match the value of the conductivity calibration solution. Most conductivity solutions are labeled with a value at 25°C. If calibrating specific conductance, enter the value listed for 25°C. If calibrating conductivity, look up the value of the solution at the solution's current temperature and enter that value into the Pro1030. Press and holding either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro1030 will remember the entered calibration value and display it the next time a conductivity calibration is performed.
5. Press enter to complete the calibration or press Cal to cancel.
6. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.

7. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

CALIBRATING IN SALINITY

1. Place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 8). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.
2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight Salinity and press enter.
3. Use the up or down arrow key to adjust the value on the display to match the value of the salinity solution. Press and holding either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro1030 will remember the entered calibration value and display it the next time a salinity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting section of this manual for possible solutions.

TAKING MEASUREMENTS

Before taking measurements, be sure the instrument has been calibrated to ensure the most accurate readings. Install the sensor guard to protect the pH or ORP sensor. Place the probe in the sample to be measured and give the probe a quick shake to release any air bubbles.

CONDUCTIVITY

The conductivity sensor will provide quick readings as long as the entire sensor is submerged and no air bubbles are trapped in the sensor area. Immerse the probe into the sample so the sensors are completely submerged and then shake the probe to release any air bubbles. Occasional cleaning of the sensor may be necessary to maintain accuracy and increase the responsiveness. To clean the sensor, use the soft bristle cleaning brush provided with the instrument and a mild detergent.

pH/ORP

pH and ORP readings are typically quick and accurate. However, it may take the sensors a little longer to stabilize if they become coated or fouled. To improve the response time of a sensor, follow the cleaning steps in the Maintenance section of this manual.

SAVING AND VIEWING DATA

The Pro1030 can store 50 data sets in non-volatile memory for later viewing. A data set includes the values currently on the display, i.e. temperature, dissolved oxygen and two conductivity parameters. Each data point is referenced with a data set number, 01 through 50.

SAVING DATA

From the Run screen, use the up or down arrow keys to highlight the Save box and press enter to save the current readings. The instrument will indicate the data set is saved and display the saved data set's number (figure 9).

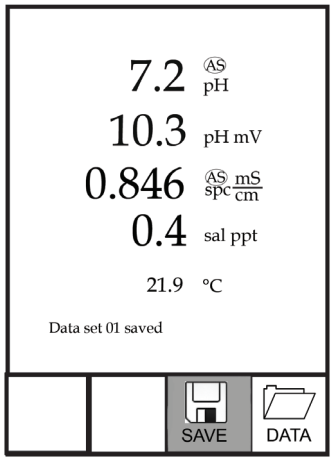


Figure 9, data set saved.

The instrument will display 'Memory Full' if all 50 data sets have been saved and you attempt to save another data set.

VIEWING AND ERASING SAVED DATA

Data mode allows you to view and erase saved data. From the Run screen, use the up or down arrow keys to highlight Data and press enter to access Data mode. Note that the function boxes at the bottom of the display are different in Data mode (figure 10).

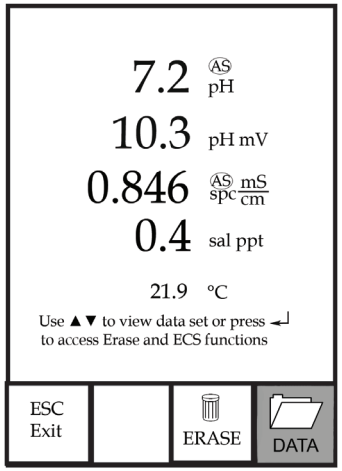


Figure 10, Data mode.

VIEWING DATA

Once in Data mode, use the up and down arrow keys to view saved data sets in sequential order or press enter to access the bottom functions. After accessing the bottom functions, highlight the Data box and press enter to regain access to viewing data. The data set displayed is indicated by the data set number, 01 through 50.

ERASING DATA

While viewing saved data, press the enter key to access the function boxes at the bottom of the display. Next, use the up or down arrow keys to highlight Erase, then press enter. The instrument will give you the option to erase one data set or all data sets (figure 11).



Figure 11, Erase data mode.

Use the up or down arrow key to select Erase Data Set, Erase All Sets or the ESC-Exit function box, then press enter to confirm.

Select ESC-Exit and press enter to exit Erase mode without erasing any data.

Select Erase Data Set and press enter to erase the data set that was displayed before entering Erase mode. For example, if data set 12 was displayed before entering erase mode, and Erase Data Set is selected, Data Set 12 will be erased from memory and the data sets AFTER that number will move up to keep them sequential. For example, if there are 15 records and number 12 is erased then 13 becomes 12, 14 becomes

13, and 15 becomes 14. The instrument will return to Data mode after erasing one data set.

Select Erase All Data Sets and press enter to clear the Pro1030 memory and return to Data mode.

EXITING DATA MODE

While in Data mode, press enter to access the bottom functions. Next, highlight the ESC-Exit box and press enter to return to the Run screen.

CARE, MAINTENANCE AND STORAGE

This section describes the proper procedures for care, maintenance and storage of the sensors. The goal is to maximize their lifetime and minimize down-time associated with improper sensor usage.

GENERAL MAINTENANCE

GENERAL MAINTENANCE - GASKET AND O-RINGS

The instrument utilizes a gasket and o-rings as seals to prevent water from entering the battery compartment and the sensor port. Following the recommended procedures will help keep the instrument functioning properly.

If the gasket, o-rings and sealing surfaces are not maintained properly, it is possible that water can enter the battery compartment and/or sensor port of the instrument. If water enters these areas, it can damage the battery terminals or sensor port causing loss of battery power, false readings and corrosion to the sensors or battery terminals. Therefore, when the battery compartment lid is removed, the gasket that provides the seal should be carefully inspected for contamination (i.e. debris, grit, etc.) and cleaned with water and mild detergent if necessary.

The same inspection should be made of the o-rings associated with the ISE sensor connector when replacing the ISE sensor. The o-rings should be free of dirt or debris before installing the sensor onto the cable.

GENERAL MAINTENANCE - ISE SENSOR PORT

It is important that the entire sensor connector end be dry when installing, removing or replacing the sensor. This will prevent water

from entering the port. Once the ISE sensor is removed, examine the connector inside the port. If any moisture is present, use compressed air to completely dry the connector or let it air dry. If the connector is corroded, contact YSI Technical Support or the YSI authorized dealer where you purchased the instrument.

SENSOR MAINTENANCE

> ⓘ *Typical working life for pH and ORP sensors is approximately 12-24 months depending on usage, storage and maintenance. Proper storage and maintenance generally extends the sensor's working life.*

SENSOR MAINTENANCE - TEMPERATURE

You must keep the temperature sensor free of build up. No additional maintenance is required. A toothbrush can be used to scrub the temperature sensor if needed.

SENSOR MAINTENANCE - CONDUCTIVITY

The openings that allow sample access to the conductivity electrodes should be cleaned regularly. The small cleaning brush included in the Maintenance Kit is intended for this purpose. Dip the brush in clean water and insert it into each hole 10 to 12 times. In the event that deposits have formed on the electrodes, it may be necessary to use a mild detergent (laboratory grade soap or bathroom foaming tile cleaner) with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity cell with a calibration solution.

SENSOR MAINTENANCE - pH AND ORP

Cleaning is required whenever deposits or contaminants appear on the glass and/or platinum sensor surfaces or when the sensor's response slows. The cleaning can be chemical and/or mechanical.

Removing the sensor from the cable may make cleaning easier. Initially, use clean water and a soft clean cloth, lens cleaning tissue, or cotton swab to remove all foreign material from the glass bulb and/or platinum button. Then use a moistened cotton swab to carefully remove any material that may be blocking the reference electrode junction of the sensor.
If good pH and/or ORP response is not restored, perform the following additional procedure:

1. Soak the sensor for 10-15 minutes in clean water containing a few drops of commercial dish washing liquid.
2. GENTLY clean the glass bulb and platinum button by rubbing with a cotton swab soaked in the cleaning solution.
3. Rinse the sensor in clean water, wipe with a cotton swab saturated with clean water, and then rerinse with clean water.

If good pH and/or ORP response is still not restored, perform the following additional procedure:

1. Soak the sensor for 30-60 minutes in one molar (1 M) hydrochloric acid (HCl). This reagent can be purchased from most lab supply distributors. Be sure to follow the safety instructions included with the acid.
2. Rinse the sensor in clean water, wipe with a cotton swab saturated with clean water (not DI water), and then rerinse with clean water. To be certain that all traces of the acid are removed from the sensor crevices, soak the sensor in clean water for about an hour with occasional stirring.

If biological contamination of the reference junction is suspected or if good response is not restored by the above procedures, perform the following additional cleaning step:

1. Soak the sensor for approximately 1 hour in a 1:1 dilution of commercially-available chlorine bleach.
2. Rinse the sensor with clean water and then soak for at least 1 hour in clean water with occasional stirring to remove residual bleach from the junction. (If possible, soak the sensor for a period of time longer than 1 hour in order to be certain that all traces of chlorine bleach are removed.) Then rerinse the sensor with clean water and retest.

ⓘ **CAUTION**: *When using a cotton swab, be careful NOT to wedge the swab between the guard and the glass sensor. If necessary, remove cotton from the swab tip, so that the cotton can reach all parts of the sensor tip without stress. You can also use a pipe cleaner for this operation if more convenient.*

ⓘ *Dry the port and sensor connector with compressed air and apply a very thin coat of o-ring lubricant to all o-rings before reinstallation.*

If this procedure is unsuccessful, as indicated by improper sensor performance, contact YSI Technical Support or the YSI authorized dealer where you purchased the instrument.

SENSOR STORAGE

SHORT TERM STORAGE

The instrument is supplied with a grey storage sleeve that slides over the probe guard. The sleeve is used for short-term storage (less than 2 weeks). Be sure to keep a small amount of moisture (clean tap water) on the sponge in the sleeve during storage. The moistened sponge in the sleeve provides a 100% water saturated air environment which is ideal for short-term sensor storage.

LONG TERM STORAGE

The conductivity sensor should be stored long term in a dry state while the ISE sensor should be stored in solution. When storing for more then 30 days, place the ISE sensor in the storage bottle that was originally included with the sensor. This can be filled with buffer 4 solution. If you no longer have the storage bottle, simply place the sensor in a buffer 4 solution. Ensure the conductivity sensor is clean and dry.

Long Term Storage Temperature: -5 to 70°C (23 to 158°F) without pH
0 to 30°C (32 to 86°F) with pH*

*Operating temperature range for pH sensor is -5 to 60°C (23 to 140°C).

TROUBLESHOOTING

Symptom	*Possible Solution*
Instrument will not turn on, a battery symbol appears, or "Critical Shutdown" displays on the screen.	1. Low battery voltage, replace batteries. 2. Batteries installed incorrectly, check battery polarity. 3. Return system for service.
Temperature values display Over or Undr on Run screen.	1. Sample temperature is less than -5° C or more than +55°C. Increase or decrease the sample temperature to bring within the allowable range. 2. Contact YSI Tech Support.

Symptom	*Possible Solution*
Instrument will not calibrate pH or ORP; instrument displays "Calibration Over", "Calibration Under", or "Unstable Reading" during calibration.	1. Verify correct sensor type selection in the System Setup menu. 2. Verify the calibration solution is accurate. 3. If calibrating pH, make sure you are calibrating buffer 7 first. 4. Clean the pH or ORP sensor. 5. Contact YSI Tech Support.
pH or ORP readings are inaccurate.	1. Verify correct sensor type selection in the System Setup menu. 2. Verify temperature readings are accurate. 3. Recalibrate the pH or ORP sensor. 4. Clean the pH or ORP sensor. 5. Contact YSI Tech Support.
pH values display Over or Undr on Run screen.	1. Verify correct sensor type selection in the System Setup menu. 2. Sample pH value is outside the measurement range of 0 to 14. 3. Verify temperature readings are accurate. 4. Recalibrate the pH sensor. 5. Clean the pH sensor and recalibrate. 6. Contact YSI Tech Support.
ORP values display Over or Undr on Run screen.	1. Verify correct sensor type selection in the System Setup menu. 2. Sample ORP value is outside the measurement range of -1500 to 1500 mV. 3. Verify temperature readings are accurate. 4. Recalibrate the ORP sensor. 5. Clean the ORP sensor and recalibrate. 6. Contact YSI Tech Support.

Symptom	*Possible Solution*
Instrument will not calibrate the Conductivity sensor; instrument displays "Calibration Over", "Calibration Under", or "Unstable Reading" during calibration.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the calibration solution is above the two holes near the cable, see figure 8. 3. Verify the calibration solution is not expired or contaminated. Try a new bottle of solution. 4. Ensure you are entering in the correct value for the solution according to the measurement units. 1 mS = 1,000 uS. 5. Allow sufficient stabilization time for conductivity and temperature AND wait at least 3 seconds before confirming a calibration. 6. Contact YSI Tech Support.
Conductivity readings are inaccurate.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8. 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Verify the correct units are setup in the System Setup menu, i.e. uS vs mS and Conductivity vs. Specific Conductance. 6. Contact YSI Tech Support.
Conductivity values display Over or Undr on Run screen.	1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual. 2. Verify the sample is above the two holes near the cable, see figure 8 3. Verify calibration. 4. Verify temperature readings are accurate. 5. Sample conductivity is outside the measurement range of the instrument, i.e. 0-200 mS. 6. Contact YSI Tech Support.

SPECIFICATIONS

These specifications represent typical performance and are subject to change without notice. For the latest product specification information, please visit YSI's website at ysi.com or contact YSI Tech Support.

Parameter	*Range*	*Resolution*	*Accuracy*
Temperature	-5 to 55°C	0.1°C	± 0.2°C
pH	0 to 14 pH units	0.01	Instrument with cable and sensor: +/- 0.2
ORP	-1500 to 1500 mV	1 mV	Instrument with cable and sensor: +/-20 mV
Conductivity	0-500 uS/cm 0-5 mS/cm 0-50 mS/cm 0-200 mS/cm (auto ranging)	0.0001 to 0.1 mS/cm; 0.1 to 0 uS/cm (range dependent)	Instrument only: ± 0.5% of the reading or 1 uS/cm, whichever is greater. Instrument with 1 or 4 meter cables: ± 1.0% of the reading or 1 uS/cm, whichever is greater. Instrument with 10, 20, or 30 meter cables: ± 2.0% of the reading or 1 uS/cm, whichever is greater.
Salinity	0 to 70 ppt	0.1 ppt	± 1.0% of the reading or ± 0.1 ppt, whichever is greater.
Total Dissolved Solids (TDS)	0 to 100 g/L. TDS Constant range: 0.3 to 1.00 (0.65 default)	0.0001 to 0.1 g/L (range dependent)	Dependent on accuracy of temperature, conductivity and TDS Constant.

ACCESSORIES / PART NUMBERS

Part Number	*Description*
6051030	Pro1030 Instrument
6261030-1, -4, -10, -20, or -30	1, 4, 10, 20, 30-meter cable assembly* (3.2, 13, 32.8, 65.6, 98.4-feet)
605101	pH Sensor
605102	ORP Sensor
603077	Flow cell
603056	Flow cell mounting spike
603075	Carrying case, soft-sided
603074	Carrying case, hard-sided
603069	Belt clip for clipping instrument onto belt
063517	Ultra clamp for instrument for clamping instrument to lab counter or other surface
063507	Tripod for instrument
603062	Cable management kit, included with all cables longer than 1 meter
605978	Cable weight, 4.9 oz, stackable
603070	Shoulder strap
038213	Soft bristle brush for cleaning conductivity cell
003821	pH 4 Buffer, box of 6 pints
003822	pH 7 Buffer, box of 6 pints
003823	pH 10 Buffer, box of 6 pints
603824	pH Buffer, assorted case, 2 pints each of buffer 4, 7 and 10
060907	Conductivity Calibration Solution, 1,000 µS/cm. 1 box of 8 pints.
060911	Conductivity Calibration Solution, 10,000 µS/cm. 1 box of 8 pints.
060660	Conductivity Calibration Solution, 50,000 µS/cm. 1 box of 8 pints.
065274	Conductivity Calibration Solution, 100,000 µS/cm. 1 box of 8 pints.

*All cables include a temperature and conductivity sensor. The pH or ORP sensor is sold separately.

DECLARATION OF CONFORMITY

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for the listed European Council Directive(s) and carries the CE mark accordingly.

Manufacturer:	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
Product Name:	Pro1030 Water Quality Instrument
Model Numbers	
Instrument/ Accessory:	Pro1030 (6051030)
Probe/Cable Assemblies:	6051030-1, -4, -10, -20, and -30
Conforms to the following:	
Directives:	EMC 2004/108/EC RoHS 2011/65/EU WEEE 2002/96/EC
Harmonized Standards:	• EN61326-1:2006 (IEC 61326-1:2005) • IEC 61000-3-2:2005 • IEC 61000-3-3:2005
Supplementary Information:	All performance met the operation criteria as follows: 1. ESD, IEC 61000-4-2:2001 2. Radiated Immunity, IEC 61000-4-3:2006 3. Electrical Fast Transient (EFT), IEC 61000-4-4:2004, +Corr. 1:2006 + Corr. 2:2007 4. Radio Frequency, Continuous Conducted Immunity, IEC61000-4-6:2006 5. IEC 6100-4-8:2001
Authorized EU Representative	Xylem Analytics UK Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK



Signed: Lisa M. Abel Date: 31 Jan 2013
Title: Director of Quality

RECYCLING

YSI is committed to reducing the environmental footprint in the course of doing business. Even though materials reduction is the ultimate goal, we know there must be a concerted effort to responsibly deal with materials after they've served a long, productive life-cycle. YSI's recycling program ensures that old equipment is processed in an environmentally friendly way, reducing the amount of materials going to landfills.

- Printed Circuit Boards are sent to facilities that process and reclaim as much material for recycling as possible.
- Plastics enter a material recycling process and are not incinerated or sent to landfills.
- Batteries are removed and sent to battery recyclers for dedicated metals.

When the time comes for you to recycle, follow the easy steps outlined at www.ysi.com.

BATTERY DISPOSAL

The Pro1030 is powered by alkaline batteries which the user must remove and dispose of when the batteries no longer power the instrument. Disposal requirements vary by country and region, and users are expected to understand and follow the battery disposal requirements for their specific locale.

CONTACT INFORMATION

ORDERING AND TECHNICAL SUPPORT

Telephone: 800 897 4151 (USA)
+1 937 767 7241 (Globally)
Monday through Friday, 8:00 AM to 5:00 ET
Fax: +1 937 767 9353 (orders)
+1 937 767 1058 (technical support)
Email: environmental@ysi.com
Mail: YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387 USA
Internet: ysi.com

When placing an order please have the following available:
1.) YSI account number (if available)
2.) Name and phone number
3.) Purchase Order or Credit Card number
4.) Model Number or brief description
5.) Billing and shipping addresses
6.) Quantity

SERVICE INFORMATION

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151 (+1 937-767-7241).

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from ysi.com by clicking on the 'Support".

Item # 605182
Rev A
January 2013

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Attachment K

Current Quality Assurance Manual

ENVIRONMENTAL® STANDARDS

Setting the Standards for Innovative Environmental Solutions

US ECOLOGY, INC.
ENVIRONMENTAL TESTING LABORATORY PROGRAM
SERVICES AND TECHNICAL SPECIFICATIONS MANUAL

May 18, 2020

Prepared for

US ECOLOGY, INC.
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Pr□□d□d h□r□n □s th□ □□S □□□□□□□□ T□□hn□□□□Sp□□□□□□t□□ns M□nu□□□□TSM□d□t□d M□□ □□□□□□□□□□Th□s d□□u□ □nt □s t□ □□ □□nsid□r□d □ □S □□□□□□□□□□n□□□□S □□□□□□□□□□□□us□n□ss □□n□d□nt□□□d□□u□ □nt □nd □s □s□d□s□□n□t□d □s th□ □nt□□□□□tu□□pr□p□rt□ □□□□n□r□n□ □nt□□ St□nd□rds□□n□□□□n□r□n□ □nt□□St□nd□rds□□□n□r□n□ □nt□□St□nd□rds h□s □□r□ □□□□ □□r□□d t□ p□r□ t□S □□□□□□□□p□rs□nn□□□□urr□nt □nd pr□□□□us □S □□□□□□□□ □□nsu□t□nts □□t□n□ □n □□h□□□□□□ □S □□□□□□□□□□nd □urr□nt □nd pr□□□□us □S □□□□□□□□□□□□ntr□□t□d □□□□r□t□r□s us□ □□th□s Pr□pr□□t□r□ D□□u□ □nt □□r th□s□□□ purp□s□ □□□□□□□□ut□n□ □□r□ □n □□h□□□□□□□S □□□□□□□ □□□□us□□□□□ □n □S □□□□□□□□ □n□r□n□ □nt□□t□st□n□ pr□□□□ts□□□ □□□□pt□n□ th□ tr□ns□ ss□□n □□th□s d□□u□ □nt□th□ r□□p□□nt h□r□□□ □□r□□s t□ pr□t□□t □nd □□□ t th□ d□str□ut□□n □n□t t□ h□□□ th□s d□□u□ □nt r□pr□du□□d □□ p□rt □r □h□□□□□□nd n□t t□ pr□□d□ th□s d□□u□ □nt □□ p□rt □r □h□□□□t□ □n□p□rs□n □r □nttt□ □h□ s n□t d□r□□t□□p□r□□r□ □□ □□r□ □□r □S □□□□□□□□ □□th□ut th□ □□pr□ss□d □rtt□n p□r□ ss□□n □□□□S □□□□□□□□ □nd □n□r□n□ □nt□□St□nd□rds□

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Attachment D **Data Package Deliverable Specifications**

Attachment E **Documents to be Submitted to US Ecology**

Attachment F **Method-specific QA/QC Requirement Tables**

List of Acronyms

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□D	P□r□□nt D□□□r□n□□
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1.0 SCOPE-OF-WORK

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2.0 QUALITY CONTROL PRACTICES

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3.0 SCHEDULING AND REPORTING

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4.0 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

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5.0 DISTRIBUTION, REVISION, AND RETRIEVAL OF THE SERVICES AND TECHNICAL SPECIFICATIONS MANUAL

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ATTACHMENT A

ATTACHMENT A

GUIDANCE FOR SUMMA CANISTER AND FLOW CONTROLLER CLEANING AND CERTIFICATION FOR PROJECTS REQUIRING METHOD TO-14 OR TO-15 ANALYSIS

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ATTACHMENT B

ATTACHMENT B

PROCEDURES FOR SOLID SAMPLE COLLECTION, STORAGE, AND PRESERVATION FOR VOLATILE ORGANIC COMPOUND ANALYSES

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EXHIBIT A: Laboratory Options for the Preservation of Solid Samples Received in En Core Samplers *

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EXHIBIT B: Field Preservation of Solid Samples Using Terra-Core Syringes or Equivalent

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EXHIBIT C: Bottleware or SW-846 Method 5030/5030A Sample Storage Vessels Used

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ATTACHMENT C

ATTACHMENT C

PROCEDURES FOR SAMPLE PREPARATION, ANALYSIS, AND REPORTING OF PER- AND POLYFLUOROALKYL SUBSTANCES

This attachment specifically addresses sample preparation, analysis, and reporting of PFAS. This attachment is meant to supplement and be used in conjunction with the requirements specified within the TSM. The analytical data must be accurately and precisely generated and reported in compliance with the guidance stated herein and "industry standards."

C.1 General Sample Preparation

US Ecology has the following general sample preparation guidance in addition to those presented in Sections C.2 and C.3.

- Sample extracts must be stored in the same type of vials and solvent as the associated calibration standards.
- The samples, sample extracts, and standards stored in the refrigerator/freezer must be allowed to come to room temperature and vortexed prior to use.
- All sample preparations must be fully documented, inclusive of the preparation conditions. Documentation allowing complete traceability to all prepared or purchased reagents, solvents, spike solutions, SPE cartridges, and lot numbers of all other applicable consumables (*e.g.*, vial lot numbers, *etc.*).
- All solvents and reagents must be verified and documented for cleanliness prior to being used to prepare US Ecology samples. For purposes of this requirement, each PFAS compound requested for analysis must be less than ½ the laboratory's RLs.
- Complete and unequivocal documentation (*e.g.*, logbooks/database and certificates of analysis) must exist to enable traceability of all prepared spike solutions, calibration solutions, and prepared reagents back to the reference/salt materials utilized.

C.2 Aqueous Sample Preparation

US Ecology has the following guidance for the preparation of aqueous samples. These guidance items are in addition to laboratory SOPs. Any deviations from the guidance below must be approved in writing by US Ecology personnel prior to preparing the sample and the rationale and deviation must be included in the Case Narrative. Sample extracts will be analyzed in accordance with the analytical guidance listed in Section C.4 and Attachment E.

- Samples must be extracted within 14 days of sample collection. Sample extracts must be analyzed within 28 days of extraction.
- Aqueous samples and sample extracts must be stored at ≤ 6°C. Storage of aqueous samples and sample extracts in a freezer is preferred.

- Aqueous samples will be extracted using the SPE technique. The SPE cartridge type utilized must have documented acceptable performance for all target compounds requested to be analyzed for the project samples. The laboratory must have a valid MDL study for each SPE cartridge type used for sample preparation.

- The laboratory must utilize the entire sample provided for sample preparation. If the laboratory anticipates that the entire sample cannot be utilized, the laboratory must obtain written approval from US Ecology personnel prior to proceeding with the sample preparation. The laboratory must document any alternative extraction procedures/volumes utilized in the SDG Narrative (*e.g.*, centrifuge and decant due to solids in aqueous sample).

- The laboratory must add the surrogate and/or isotope dilution labeled standard solutions directly to the sample container prior to transferring the sample to the SPE unit. After addition, the sample container must be capped and inverted to thoroughly mix the sample.

- After pouring the entire sample to the SPE unit, the laboratory must rinse the sample container with the extraction solvent as part of the quantitative sample transfer to the SPE unit.

- The final sample extraction solvent must be a combination of water and methanol. The laboratory must utilize a solvent that has at least 80% methanol.

- All sample extracts must undergo cleanup using the ENVI-Carb™ cartridge or equivalent.

- Sample extracts may undergo a concentration step to improve sensitivity or as part of a solvent exchange, but is not required.

C.3 Solid Sample Preparation

US Ecology has the following guidance for solid sample preparations. These guidance items are in addition to any laboratory standard operating procedure. Any deviations from the guidance below must be approved in writing by US Ecology personnel prior to preparing the sample, and the rationale and deviation must be included in the SDG Narrative. Sample extracts will be analyzed in accordance with the analytical guidance listed in Section C.4 and Attachment E.

- Samples must be well-homogenized and extracted within 28 days of sample collection. Sample extracts must be analyzed within 28 days of extraction.

- Solid samples and sample extracts must be stored at ≤ 6°C. Storage of solid samples and sample extracts in a freezer is preferred.

- The entire solid sample submitted must be homogenized prior to aliquoting for extraction.

- The final sample extraction solvent must be a combination of water and methanol or other polar solvent. The laboratory must utilize a solvent that has at least 80% methanol.

- The laboratory must add the surrogate and/or isotope dilution labeled standard solutions to the solid sample aliquot prior to the addition of the extraction solvent.

- The solid sample and extraction solvent must be sonicated or vortexed as part of the extraction process.

- If the SPE technique is used during the solid sample extraction procedure, the SPE cartridge type utilized must have documented acceptable performance for all target compounds requested to be analyzed for the project samples. The laboratory must have a valid MDL study for each SPE cartridge type used for sample preparation.

- All sample extracts must undergo cleanup using the ENVI-Carb™ cartridge or equivalent.

- Sample extracts may undergo a concentration step to improve sensitivity as part of a solvent exchange, but is not required.

C.4 Analytical Procedures

This section and Attachment E provide analytical guidance for PFAS analyses. General QC protocols for analyses will be required as follows:

- Initial calibration and second-source standards must include branched and linear isomers when commercially available. The use of quantitative standards that include branched and linear for the initial calibration is highly preferred. However, if only qualitative standards are available for several branched and linear PFAS, the laboratory must include a standard after the last quantitative calibration standard to establish retention times.

- The laboratory must have established ion transitions for each PFAS compound reported. A minimum of two ion transitions should be monitored, except for PFBA and PFPeA for which two transitions are not available.

- Identification or quantitation of a branched isomer shall not be performed if that branched isomer was not present in the initial calibration or qualitative standard analysis.

- The isotope dilution technique is required (or extracted internal standard quantitation where an isotopically labeled analog of an analyte is unavailable). Internal standard (added post extraction) calibration technique for target compounds is acceptable. External standard calibration and quantitation for target compounds is not acceptable. As labeled analog is not available for all target compounds, the laboratory must utilize the extracted internal standard compound with the closest retention time for quantitation. The laboratory should utilize all available labeled analogs for isotope dilution analyses.

- Initial and continuing calibration acceptance criteria are presented in Attachment E. The laboratory may utilize any calibration equation; however, the recovery criteria must be met to utilize the calibration equation.

- Quantitate and report results by integrating the total response (*e.g.*, linear and branched peaks) as defined by the initial calibration and/or qualitative standards.

- A minimum of five calibration standards is required for initial calibration, additional standards may be required to accommodate the laboratory-selected calibration equation (*e.g.*, six standards required for quadratic equations). The initial calibration includes surrogate compounds and extracted internal standard compounds, when utilized.

- The lowest concentration initial calibration standard must be at or below the RL.

- After the initial calibration standards have been analyzed and calibration established, the laboratory must quantitate the initial calibration standards utilizing the established calibration equation and meet the criteria presented in Attachment E.

- The second-source standard or ICV standard must be prepared form a source independent of the initial calibration standards. If a second source is not available for a compound, that compound is not required to be included in the ICV standard. The laboratory must clearly state which compounds do not have a second source in the SDG Narrative.

- The concentration of the CCV standard must be at or near the mid-point of the calibration range of the instrument.

- The working initial calibration standard, ICV, and CCV standards must be in the same solvent as the sample final extracts.

- All method blank, LCS, MS, MSD, and laboratory duplicate aliquots must undergo all the same sample preparative and cleanup procedures as the associated project samples.

- If the linear/branched isomer peak ratio for target PFAS in the sample is different than the calibration standard, the laboratory must flag the result as estimated and include a commentary in the SDG Narrative

- The laboratory must have a clear policy regarding when/if a sample extraction would have additional labeled standard added because of sample dilution. If the sample extract dilution is fortified with additional labeled extraction internal standard solution, the laboratory must document the addition in the SDG Narrative and flag the associated data.

- As an alternate to extract dilution, the laboratory can prepare a second aliquot of the sample utilizing a lower initial sample volume/weight or spike with a higher concentration of extraction standard compounds and utilize an elevated final concentration.

- For isotope dilution analyses, if matrix effects render an extracted internal standard compound unusable for quantitation, the laboratory may utilize an alternative extracted internal standard compound for quantitation. The laboratory must provide initial calibration, second-source standard, associated CCV standard, and LCS results utilizing the alternate native and extracted internal standard compound association to demonstrate acceptability.

Additional specific analytical guidance items are included in Attachment E.

ATTACHMENT D

ATTACHMENT D

DATA PACKAGE DELIVERABLE SPECIFICATIONS

Required Data Deliverables Elements

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Element	GC/MS Analyses	GC Analyses	LC/MS/MS Analyses	HPLC Analyses
□□□□r □□tt□r□□□tt□r □□Tr□ns□ □tt□□	□	□	□	□
SD□ □□rr□t□□□	□	□	□	□
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S□□ p□□ R□□□□pt D□□u□ □nt□t□□n □□□□	□	□	□	□
Pr□□□□t □□rr□sp□nd□n□□	□	□	□	□
T□r□□t □ □□ p□und □n□□t□□□□R□sults Su□ □ □r□	□	□	□	□
T□□ □n□□t□□□□R□sults Su□ □ □r□	□[1]	□ □□□	□ □□□	□ □□□
Surr□□□t□ □ R Su□ □ □r□	□	□	□	□
□□tr□□t□d □S R□□□□□□r□ Su□ □ □r□ □□□ □□tr□□t□d □nt□rn□□st□nd□rds □□r □s□t□p□d□ut□□n □r□ut□□□□d□	□[1]	□ □□□	□[1]	□ □□□
□nstru□□nt □S □r□□ Su□ □ □r□ □□□ □□tr□□t□d □nt□rn□□st□nd□rds □□r □s□t□p□d□ut□□n □r□ut□□□□d□	□[1]	□ □□□	□[1]	□ □□□
MS□MSD Su□ □ □r□	□	□	□	□
□□□□r□t□r□Dup□□□t□ Su□ □ □r□	□[1]	□[1]	□[1]	□[1]
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M□th□d □□□n□Su□ □ □r□	□	□	□	□
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□ □□MS Tun□□ □nd M□ss □□□□r□t□□n Su□ □ □r□	□	□ □□□	□ □□□	□ □□□
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DDT□ndr□n □r□□□d□□n Su□ □ □r□ □□r□	□[1]	□[1]	□ □□□	□ □□□
□S □r□□ □nd R□t□nt□□n T□□ □Su□ □ □r□	□	□[1]	□	□[1]
S□□ p□□ R□□ D□t□	4	4	4	4

Element	GC/MS Analyses	GC Analyses	LC/MS/MS Analyses	HPLC Analyses
St□nd□rds R□□ D□t□	4	4	4	4
R□□ □ □ D□t□	4	4	4	4
T□□P □r SP□P Pr□p□r□t□□n □□□s	4□	4□	4□	4□
□tr□□t□□n □□□s	4	4	4	4
□P□ tr□□□s	4□	4□	4□	4□
□□□□nup □□□s	4□	4□	4□	4□
T□r□□t □nd □□□□□□□d St□nd□rds Pr□p□r□t□□n D□□u□ □nt□t□□n	4	4	4	4

□□t□s□

□ R□□u□□d □□□□ □nt □r □□d□□□□r□□□s □□□□s
□□□ □□t □pp□□□□□□□t□ th□ □n□□s□s
□ R□□u□□d □dd□t□□n□□□□□□ □nt □r □□□□□□□ D□□□□r□□□s □n □dd□t□□n t□ □□□□ □nts r□□u□□d □r □□□ d□□□□r□□□s □□□□s□
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	ICP Metals	ICP/MS Metals	Mercury	General Chemistry Parameters
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	ICP Metals	ICP/MS Metals	Mercury	General Chemistry Parameters
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ATTACHMENT E

ATTACHMENT E

DOCUMENTS TO BE SUBMITTED TO US ECOLOGY

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ATTACHMENT F

Table 1
Sample Vessel/Media Shipment Preparation
Quality Control Requirements

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Table 1
Sample Vessel/Media Shipment Preparation
Quality Control Requirements

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Table 2
Sample Receipt
Quality Control Requirements

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Table 2
Sample Receipt
Quality Control Requirements

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Table 3
Sample Methods

Parameter(s)	Method[1,2]	QC Table
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Table 3
Sample Methods

Parameter(s)	Method[1,2]	QC Table
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Table 3
Sample Methods

Parameter(s)	Method[1,2]	QC Table
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Table 4
TCLP & SPLP Extractions - US EPA Methods 1311 & 1312
Quality Control Requirements

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Table 4
TCLP & SPLP Extractions - US EPA Methods 1311 & 1312
Quality Control Requirements

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Table 4
TCLP & SPLP Extractions - US EPA Methods 1311 & 1312
Quality Control Requirements

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Table 4
TCLP & SPLP Extractions - US EPA Methods 1311 & 1312
Quality Control Requirements

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Table 4
TCLP & SPLP Extractions - US EPA Methods 1311 & 1312
Quality Control Requirements

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Table 5
Volatiles - US EPA Method TO-15
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Actions
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Table 5
Volatiles - US EPA Method TO-15
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Actions
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Volatiles - US EPA Method TO-15
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Actions
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Table 5
Volatiles - US EPA Method TO-15
Quality Control Requirements

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Table 6
Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

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Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

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Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

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Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

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Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Method Blank	One per batch tuned per 12 hours	Target compounds < the RL Must contain internal standard and surrogate recoveries	Reprepare and reanalyze the batch if the source of contamination is not confirmed. If confirmed, reanalyze after system is corrected. Reprepare and reanalyze associated samples contaminated in the batch Reanalyze to confirm. If surrogate or internal standard recoveries are not met, reanalyze If samples prepared with the batch are ND or if reanalysis is successful, report results. Otherwise, report first analysis and notify client If acceptance criteria is required in the contract, if it is not defined in the SOP, if it is defined in the SOP as per client, if not defined in the SOP or if the SOP is not followed, notify the client

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Quality Control Requirements

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Table 6
Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

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Table 6
Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

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Table 6
Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

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Table 6
Volatiles - SW-846 Method 8260 & US EPA Method 624.1
Quality Control Requirements

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Table 7
Semivolatiles - SW-846 Method 8270 & US EPA Method 625.1
Quality Control Requirements

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Table 7
Semivolatiles - SW-846 Method 8270 & US EPA Method 625.1
Quality Control Requirements

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Table 7
Semivolatiles - SW-846 Method 8270 & US EPA Method 625.1
Quality Control Requirements

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Table 7
Semivolatiles - SW-846 Method 8270 & US EPA Method 625.1
Quality Control Requirements

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Table 7
Semivolatiles - SW-846 Method 8270 & US EPA Method 625.1
Quality Control Requirements

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Table 7
Semivolatiles - SW-846 Method 8270 & US EPA Method 625.1
Quality Control Requirements

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Quality Control Requirements

Quality Control Element	Frequency	Acceptance Criteria	Corrective Action
Method Blank	Method Blanks are performed for the purpose of Contamination or Carryover	Method Blanks must be processed with the Associated Samples	
		Method Blanks must be evaluated and approved by the Supervisor	

Notes:

- The surrogate should be spiked into the sample prior to preparation for target compounds the surrogate is not spiked into the calibration standards The surrogate must be included in the sample preparation and this document must be noted in the case narrative

- Initial calibration is performed with minimum calibration standards The minimum calibration standard must be at or below the RQL when the initial calibration RSD criteria is not met continuing calibration standards may be used for calibration points The calibration curve must be verified with the analysis of continuing calibration points must occur with the analytical sequence The RQL is the calibration point must be within of the expected value (or) must be ≥ 0.99

- When using the minimum required response factor system the lowest calibration point must be equivalent to the Reporting Limit (RL) The calibration point must be within of the true value for the RL Reported detected compounds must be confirmed by analysis of a second column or confirmation technique Examples of confirmation techniques include *e.g.* analysis of the sample using an alternate chromatographic column or technique

- The internal standard must be added to sample extracts and standards at the concentration specified by the laboratory The internal standard must be chosen to elute near the compounds of interest and be resolved from other components in the sample The laboratory should monitor the internal standard response and the chromatographic profile for performance changes noted during the calibration check must be evaluated prior to sample analysis Samples analyzed when internal standard responses and retention times are outside of acceptable limits may be reanalyzed

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Table 7
Semivolatiles - SW-846 Method 8270 & US EPA Method 625.1
Quality Control Requirements

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Table 7
Semivolatiles - SW-846 Method 8270 & US EPA Method 625.1
Quality Control Requirements

- Trip blanks associated with samples must not be reported when chain of custody is suspended and data is unusable unless requested by client.

- Insufficient sample volume must be noted in the report.

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Table 8
Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

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Table 8
Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

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Quality Control Requirements

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Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

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Table 8
Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

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Table 8
Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

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Table 8
Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

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Quality Control Requirements

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Table 8
Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

Quality Control Element	Preparation	Acceptance Criteria	Corrective Action
Quality Control Samples	With the instrument calibration standards, prepare a mid-range calibration verification standard containing the compounds listed in the calibration range.	The instrument calibration verification standard must be within the calibration range.	Dilute the sample prior to preparation and re-analyze the sample within the calibration range.
	With the calibration verification standard, prepare a laboratory control sample (LCS) containing the compounds listed in the calibration range.	Sample chromatograms must not display evidence of carryover in the RT window for the lowest point calibration standard.	The quantitation and qualitation reports must be reviewed to ensure that the analytes are properly identified.
		Surrogate recoveries must be evaluated for each sample, blank, and QC sample.	The sample must be re-analyzed if the surrogate recoveries do not meet the criteria.
		The LCS must be prepared and analyzed with each batch of samples. LCS recoveries must meet laboratory-generated control limits.	
Method Modifications	Method modifications are not permitted for this procedure.	Method modifications must be approved in accordance with the Corrective Action SOP.	None

Notes:

- The surrogate should be spiked into the sample prior to the sample preparation procedure for extractable compounds. The surrogate is not spiked into the calibration standards. Surrogate recoveries must be included in the SDG Narrative.

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Table 8
Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

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Table 8
Organochlorine Pesticides - SW-846 Method 8081 & US EPA Method 608.3
Quality Control Requirements

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Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

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Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

Quality Control Element	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration Verification	Second source standard calibration verification standard analyzed at 100% of the calibration curve. Must be analyzed after every initial calibration.	Drift for Decomposer Must be ≤ 15% for each analyte and surrogate.	Correct source and reanalyze standards.
Continuing Calibration Verification	Second source standard analyzed at 100% of the calibration curve. Must be analyzed at the beginning and end of each analytical sequence and after every 10 samples.	RT of each analyte must fall within the established RT window and standards must display acceptable peak resolution. The mid-point standard must be analyzed at the beginning of each analytical sequence and after every 10 samples. Drift for Decomposer Must be ≤ 15% for each analyte and surrogate.	Correct source and reanalyze standards and samples run since last acceptable standard. Results for samples that cannot be reanalyzed must be flagged.
Method Blank	One per extraction batch of 20 samples or less. Must be analyzed with every batch of samples.	Must be free of analytes of interest at the RL.	Correct source and reanalyze method blank and samples run since last acceptable method blank. Results for samples that cannot be reanalyzed must be flagged.
Laboratory Control Sample (LCS)	One per extraction batch of 20 samples or less. Must be analyzed with every batch of samples.	Drift for Decomposer Must be ≤ 15% for each analyte and surrogate.	Correct source and reanalyze LCS and samples run since last acceptable LCS. Results for samples that cannot be reanalyzed must be flagged.

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Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

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Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

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Quality Control Requirements

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Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per preparation batch up to 20 samples. The MS/MSD must undergo all steps of the preparation procedures and must be spiked with the target chromatographic constituents (*e.g.*, chromatographic fingerprint) and processed through the determinative procedures.	RPDs within laboratory control limits.	Report results with the MS/MSD outliers in the QC report. Matrix interference may be indicated (*e.g.* non-homogeneous sample).
Internal Standards (IS)	Add to all samples, standards, and QC samples.	Peak response within -50% to +100% of the response in the most recent CCV. RT within ±30 seconds of RT in the most recent CCV.	Inspect instrument for malfunction. Reanalyze affected samples. If internal standard malfunction is confirmed, report results with the QC failure noted.

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Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Duplicate Analysis	Each batch of samples processed	Relative percent difference (RPD) ≤ 40%	If the RPD exceeds the acceptance criteria, the analyst must review the calculations and instrument data. If no problem is found, the analyst must report the results and flag the data as estimated.
Matrix Spike	Each batch of samples processed	Percent recovery (%R) must be within laboratory-established limits	The analyst must review the calculations and instrument data. If no problem is found, the analyst must report the results and flag the data as estimated.
Surrogate Spike	Each sample, standard, and blank	Percent recovery (%R) must be within laboratory-established limits	The analyst must review the calculations and instrument data. If no problem is found, the analyst must report the results and flag the data as estimated. The analyst MUST add a statement to the data report that the results are estimated.
Laboratory Control Sample	Each batch of samples processed	Percent recovery (%R) must be within laboratory-established limits	If the %R exceeds the acceptance criteria, the analyst must review the calculations and instrument data. If no problem is found, the analyst must report the results and flag the data as estimated. **This must be noted in the Laboratory Case Narrative.**

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Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

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Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

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Quality Control Requirements

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Business Confidential

Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

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Table 9
Polychlorinated Biphenyls - SW-846 Method 8082 & US EPA Method 608.3
Quality Control Requirements

- Instrument conditions run during this sequence need not be identical to instrument conditions prior to analysis unless the instrument conditions are changed to bring another analyte into calibration range.

- Equipment, procedures, and corrective action must be used to ensure instrument stability after changes in calibration range and to document corrective action reporting when criteria is exceeded.

Table 10
Volatiles - SW-846 Method 8021
Quality Control Requirements

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Table 10
Volatiles - SW-846 Method 8021
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Instrument Blanks	Analyzed after standards, instrument blanks are analyzed at the beginning of each analysis sequence with known compounds. Must not be analyzed after standards	Target analyte results below the RL	Reanalyze blank sequence until analyte is not detected in the blank sequence
Method Blank Preparation Blank	One per batch of ≤ 20 samples per day. Must processed through the same sample preparation steps	Target analyte results below the RL Must not contain standard and surrogate for preparation and	Reanalyze blank sequence until analyte is not detected in the blank sequence

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Table 10
Volatiles - SW-846 Method 8021
Quality Control Requirements

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Table 10
Volatiles - SW-846 Method 8021
Quality Control Requirements

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Table 10
Volatiles - SW-846 Method 8021
Quality Control Requirements

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Table 10
Volatiles - SW-846 Method 8021
Quality Control Requirements

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Table 10
Volatiles - SW-846 Method 8021
Quality Control Requirements

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Quality Control Requirements

Notes:

- [illegible] spaced [illegible] standards. The [illegible] standard must be at or [illegible] the RL. When the [illegible] RSD criterion is not [illegible] standards [illegible] used for [illegible] points [illegible] used for [illegible] the [illegible] ends [illegible] the [illegible] range. [illegible] consistent [illegible] the [illegible] requirements [illegible] points must occur [illegible] prior [illegible] the [illegible] standard is dropped. The RL must be verified to the [illegible] by the [illegible] standard [illegible] the [illegible] compounds must be [illegible] using [illegible] or [illegible] curve [illegible] the RSD [illegible] cannot be [illegible] when [illegible] or [illegible] curve is utilized, the correlation coefficient (r^2) must be ≥ 0.990.

- [illegible] the [illegible] standard must [illegible] the [illegible] point must be [illegible] the [illegible] this is [illegible] to [illegible] the [illegible] The [illegible] the [illegible] point must [illegible] then [illegible] the standard is true [illegible] the [illegible] and [illegible] standard [illegible] the [illegible] standard must [illegible] the [illegible] standards [illegible] the [illegible] standard [illegible] purchased [illegible] the [illegible] standard is used to [illegible] the [illegible] standard [illegible] the [illegible] standard [illegible] the [illegible] must [illegible] the [illegible] that the [illegible] standard [illegible] the [illegible] standard [illegible] the [illegible] standard [illegible] the [illegible] standard [illegible] the [illegible] must [illegible] the [illegible] standard is [illegible] the [illegible] standard [illegible] the [illegible] standard [illegible] the [illegible] standard

Table 10
Volatiles - SW-846 Method 8021
Quality Control Requirements

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Table 8
Non-Halogenated Organics - SW-846 Method 8015
Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Direct Aqueous Injection (DAI; Alcohols and Glycols)
Quality Control Requirements

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Table 8
Non-Halogenated Organics - SW-846 Method 8015
Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Direct Aqueous Injection (DAI; Alcohols and Glycols)
Quality Control Requirements

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Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Direct Aqueous Injection (DAI; Alcohols and Glycols)
Quality Control Requirements

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Quality Control Requirements

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Table 8
Non-Halogenated Organics - SW-846 Method 8015
Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Direct Aqueous Injection (DAI; Alcohols and Glycols)
Quality Control Requirements

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Table 8
Non-Halogenated Organics - SW-846 Method 8015
Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Direct Aqueous Injection (DAI; Alcohols and Glycols)
Quality Control Requirements

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Table 8
Non-Halogenated Organics - SW-846 Method 8015
Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Direct Aqueous Injection (DAI; Alcohols and Glycols)
Quality Control Requirements

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Table 8
Non-Halogenated Organics - SW-846 Method 8015
Gasoline Range Organics (GRO), Diesel Range Organics (DRO), and Direct Aqueous Injection (DAI; Alcohols and Glycols)
Quality Control Requirements

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Table 12
Organophosphorus Pesticides - SW-846 Method 8141
Quality Control Requirements

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Table 12
Organophosphorus Pesticides - SW-846 Method 8141
Quality Control Requirements

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Table 12
Organophosphorus Pesticides - SW-846 Method 8141
Quality Control Requirements

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Table 12
Organophosphorus Pesticides - SW-846 Method 8141
Quality Control Requirements

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Table 12
Organophosphorus Pesticides - SW-846 Method 8141
Quality Control Requirements

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Table 12
Organophosphorus Pesticides - SW-846 Method 8141
Quality Control Requirements

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Table 13
Herbicides - SW-846 Method 8151
Quality Control Requirements

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Table 13
Herbicides - SW-846 Method 8151
Quality Control Requirements

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Quality Control Requirements

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Quality Control Requirements

Quality Control	Frequency	Description/Criteria	Corrective Action
Calibration Verification Standard	One per 10 samples	Recoveries within 80-120% of true values	Recalculate results; if problem persists, recalibrate instrument and reanalyze samples since last acceptable calibration verification
Method Blank	One per extraction batch of up to 20 samples	Below reporting limit	Reanalyze blank and samples if target analytes are detected in the blank at concentrations greater than the reporting limit and greater than 10% of the sample concentration
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per extraction batch of up to 20 samples of similar matrix	Recoveries and RPDs within laboratory-generated control limits	Flag MS/MSD results in the QC report; no corrective action required unless data quality objectives are not met
Surrogate Spikes	Every sample, standard, and QC sample	Recoveries within laboratory-generated control limits	Reanalyze if surrogate recoveries are outside control limits due to matrix interference; if reanalysis confirms matrix effects, report data with qualifiers
Laboratory Control Sample (LCS)	One per extraction batch of up to 20 samples	Recoveries within laboratory-generated control limits	Reanalyze LCS and samples if recoveries are outside control limits; if reanalysis confirms out-of-control condition, report data with qualifiers

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Quality Control Requirements

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Table 13
Herbicides - SW-846 Method 8151
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Quantitation Issues	With each extraction batch of 20 samples or less, the laboratory must analyze a blank sample that contains all of the target compounds and surrogates at the concentration required by the calibration curve. The blank must be carried through the entire analytical procedure. The concentration of the target compounds in the blank must be less than the RL for each compound. If the concentration of a target compound in the blank is greater than the RL, but less than 10 times the concentration found in the associated sample, the sample must be re-extracted and reanalyzed. If the concentration of a target compound in the blank is greater than the RL and greater than 10 times the concentration found in the associated sample, the sample must be re-extracted and reanalyzed.	The laboratory must demonstrate that the target compounds are free from interferences under the conditions of the analysis by analyzing a blank sample. The blank must be analyzed after the calibration verification and before the analysis of samples. Samples processed with contaminated blanks must be re-extracted and reanalyzed. The laboratory must report all data for samples processed with contaminated blanks. The laboratory must also report the concentration found in the blank.	Document the source of contamination and report the data for the affected samples. The laboratory must also report the concentration found in the blank.
Method Interferences	Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to discrete artifacts or elevated baselines in chromatograms. All these materials must be demonstrated to be free from interferences under the conditions of the analysis by running laboratory blanks as described in the Quantitation Issues section.	Method interferences must be minimized. Each laboratory must, on an ongoing basis, demonstrate that the analytical system is interference free.	Clean the system as necessary to remove the interference.

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Table 13
Herbicides - SW-846 Method 8151
Quality Control Requirements

Notes:

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Table 13
Herbicides - SW-846 Method 8151
Quality Control Requirements

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Table 13
Herbicides - SW-846 Method 8151
Quality Control Requirements

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Table 14
State of Florida Method for Determination of Petroleum Residual Organic (FL-PRO)
Quality Control Requirements

Quality Control	Procedure	Acceptance Criteria	Corrective Action
Initial Calibration	Each time the instrument is set up and when calibration standard fails acceptance criteria, a minimum of five calibration standards must be analyzed to establish linearity. The lowest standard should be at or slightly higher than the practical quantitation limit (PQL) for the analytes. The highest calibration standard should be near the upper limit of the linear range.	If RSD ≤ 20%, then linearity through the origin can be assumed over the working range. Or, if a linear regression is used, the correlation coefficient must be ≥ 0.995.	If the RSD does not meet acceptance criteria, then a linear regression must be used. If the correlation coefficient does not meet acceptance criteria, then the problem must be corrected and a new calibration established.
Initial Calibration Verification	A second source calibration verification standard must be analyzed after each initial calibration.	Concentration must be ± 25% of the expected value.	Correct the problem and re-calibrate.
Method Blanks	At least one per analytical batch to be used for sample dilution, sample fortification, and to run after samples suspected of high concentration to prevent carryover.	< MDL	Re-prep
Continuing Calibration Standard (CCS)	Each time samples are analyzed, the CCS must be analyzed at the beginning and end of the run. The CCS must be prepared from a second source than the initial calibration standard.	Concentration must be ± 25%. RT must fall within the RT window.	Correct the problem, then re-analyze all samples analyzed since the last successful calibration verification. Re-analyze samples and QC samples.

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Table 14
State of Florida Method for Determination of Petroleum Residual Organic (FL-PRO)
Quality Control Requirements

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Table 14
State of Florida Method for Determination of Petroleum Residual Organic (FL-PRO)
Quality Control Requirements

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Table 14
State of Florida Method for Determination of Petroleum Residual Organic (FL-PRO)
Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH)
Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH)
Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH)
Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH)
Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH)
Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH)
Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH)
Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH) Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH) Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH) Quality Control Requirements

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Table 15
State of Massachusetts Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH)
Quality Control Requirements

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Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

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Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

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Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

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Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

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Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

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Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

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Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

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Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

- [illegible] shall be performed with each batch using calibration standards. The calibration standard must be at or below the RL. When the continuing calibration RSD or calibration is not [illegible] calibration standards [illegible] calibration points [illegible] the [illegible] ends the [illegible] calibration range. [illegible] shall occur before sample analysis. The [illegible] calibration points must [illegible] the [illegible] RL. The [illegible] must be [illegible] after calibration points have been [illegible] and prior to [illegible] samples. [illegible] calibration standard is dropped the RL must be reset to the concentration of the next [illegible] standard when [illegible] or [illegible] calibration curve is [illegible]

- When using the [illegible] or quadratic regression, [illegible] shall [illegible] the calibration point should be [illegible] the calibration curve. This is required to [illegible] that does not [illegible] the [illegible] calibration point should [illegible] the standard is true [illegible] the [illegible] "out [illegible] and the [illegible] should [illegible] appropriate [illegible] calibration [illegible] the [illegible] calibration points used [illegible] or [illegible]

- The [illegible] standard must be [illegible] an independent source [illegible] the [illegible] calibration [illegible] the [illegible] calibration curve. [illegible] the [illegible] standard other than the [illegible] where [illegible] the [illegible] used to [illegible] the [illegible] and [illegible] standard [illegible] must [illegible] written [illegible] that the [illegible] is [illegible] not [illegible] the [illegible] [illegible] must [illegible] number [illegible] and [illegible] in this [illegible]

- [illegible] shall [illegible] [illegible] standards [illegible]

- [illegible] shall [illegible] [illegible]

- [illegible] shall be [illegible] at the [illegible] [illegible] shall [illegible] [illegible] shall [illegible] [illegible] [illegible] [illegible] shall not be [illegible] [illegible]

- Surrogate [illegible] pounds must be [illegible] to [illegible] pounds [illegible] [illegible] shall [illegible] [illegible] standards and must be added to [illegible] standards [illegible] [illegible] [illegible]

- [illegible] [illegible] shall be [illegible] [illegible] runs must be [illegible]

- MS/MSD [illegible] must be [illegible] and [illegible] with [illegible] the [illegible]

- [illegible] and MS/MSD [illegible] must be [illegible] [illegible] [illegible] [illegible]

Table 16
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1005
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 17
State of Texas Total Petroleum Hydrocarbons (TPH) - TX1006
Quality Control Requirements

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Table 18
Formaldehyde – SW-846 Method 8315
Quality Control Requirements

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Table 18
Formaldehyde – SW-846 Method 8315
Quality Control Requirements

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Table 18
Formaldehyde – SW-846 Method 8315
Quality Control Requirements

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Table 18
Formaldehyde – SW-846 Method 8315
Quality Control Requirements

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Table 18
Formaldehyde – SW-846 Method 8315
Quality Control Requirements

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Table 18
Formaldehyde – SW-846 Method 8315
Quality Control Requirements

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Table 19
Per- and Polyfluoroalkyl Substances - Modified Methods
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
MS/MS Tuning	Optimize the instrument prior to analysis and when the instrument is set up, when the mass calibration and resolution need to be verified, or when routine instrument maintenance or major repairs have been performed	Mass calibration must be verified to be within the true value ± 0.5 amu and resolution must be adequate to distinguish adjacent peaks separated by 1 amu. Mass spectrum must meet PFAS standard	Perform instrument maintenance and recalibrate and reanalyze MS/MS tuning. Must meet all criteria standards before analyzing samples.
Initial calibration verification (ICV) or Continuing calibration verification (CCV) or Calibration blank	Each time the instrument is set up and when calibration verification criteria are not met	Chromatographic resolution between the linear and branched isomers must be ≤ 10% valley. Peak asymmetry factor must be between 0.8 and 1.5. Signal-to-noise ratio must be ≥ 10	Assess chromatographic performance as necessary to the instrument and reanalyze.
		The initial calibration standards must recover within ± 30% of the true value. Recovery within ± 50% of the true value is acceptable for low-level standards.	Perform instrument maintenance and recalibrate and reanalyze the instrument.
		Sensitivity must be adequate for each PFAS standard to meet the minimum reporting level	Assess sensitivity as necessary to perform instrument maintenance and recalibrate and reanalyze the instrument.
Initial calibration verification (ICV) or Continuing calibration verification (CCV)	Prior to analysis of samples and after every 10 samples	Must be within ± 30% of the true value. Recovery within ± 50% of the true value is acceptable for low-level standards.	Recalculate using a calibration curve with a new standard. Do not report data for samples associated with a failed calibration verification. Reanalyze samples in the batch.

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Table 19
Per- and Polyfluoroalkyl Substances - Modified Methods
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Table 19
Per- and Polyfluoroalkyl Substances - Modified Methods
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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M th d nn	n n th nnnr nntr nt n nn t h nn ≤ 20 samples. Must und r nn nns nn p n pr p r t nnn nd nnnnnup pr nnn dur s	nnt r nts n th R n r n nnnn nnnss nnnnt d p st nnn s nn p n r sults n h h nnnr s h h r n n t pp nnnnnnnn n p st nnn r sults n R nnn r n t r p rt d n r n nss nnnnt d s nn p s n Must n t nt rn st nd rd nd surr nnnt r nnnnnnr r t r n	R nn nnnnnn n th d nnn n n nnnnnnst nnn ut r nnnntr nt nd r n nnnnnn ss nnnnt d s nn p s nd n n rr nt nnn nt n n nn r nn nt nn n nntr t n s n nnn n th d nnn n nnnnnnn nnnnss nnnnt d s nn p s r nnn th d nnn n nnt nn nnt s n t d t nt d n th ss nnnnt d s nn p s
nnnnr t r n ntr n S nn p n nnn S	n n th nnnr nntr nt n nn t h nn ≤ 20 samples. Must und r nn nns nn p n pr p r t nnn nd nnnnnup pr nnn dur s	nnnnr t r nnnnn r t d nn ts n t t nnnnnd nnnnnnnn r nnnnnr n	R nn nnnnnn nn S n nnnnnnst nnn ut nnn rr nt s st nn nd r nnnnntr nt nd r n nnnnnn ss nnnnt d s nn p s nd n n
nrt nnd R nnr n n M t r nnnnnn RM	Pr p r t pr nnnnt d nnn n d r nu n nnn Must und r nn nns nn p n pr p r t nnn nd nnnnnup pr nnn dur s	nnd r pr nnd d nn ts	R nn nnnnnn RM n nnnnnnst nnn ut nnn rr nt s st nn nd r nnnnntr nt nd r n nnnnnn ss nnnnt d s nn p s nd n n nnn d t n nd r p rt n th n s rr t nnnnn

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Per- and Polyfluoroalkyl Substances - Modified Methods
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Table 19
Per- and Polyfluoroalkyl Substances - Modified Methods
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
S□□ p□□ D□□ut□□n □□r □s□t□p□ D□□ut□□n T□□hn□□u□	□□□nstru□ □nt □□□□□□□□r□□ r□sp□ns□□□□□ □n□ □□□□ p□und □n □s□□ p□□ □□□□□□ds th□ □nstru□ □nt □□□□□□□□th□t □□□□ p□und □n th□ □ □st □□n□□ntr□t□d □nt□□□□□□□□r□t□□n st□nd□rd□th□ s□□ p□□ □ust □□ d□□ut□d t□ □ppr□□□□ □t□□□ □ d□□□□□□□□□th□ □□□□□r□t□□n r□n□□ □nd r□□n□□□□□d□ □□th□ □□n□□ntr□t□□n □□th□ t□r□□t □n□□□t□ th□t □□□□□□d□d th□ □□□□□r□t□□n r□n□□□□s pr□s□nt □n th□s□□ p□□ □n□□□□□ □□□ □ □d□□t□□□ □□t□r th□ h□□h□□ □□nt□□ □n□t□d s□□ p□□□□□nd h□s □ □□n□□ntr□t□□n at a level ≤ 5× R□□th□n th□t s□□ p□□ □ust □□ r□□n□□□□□d t□ d□t□r□ □n□ □□□□rr□□□□r □□□urr□d□	Th□ □nstru□ □nt □□□□□□□□□□□□ □□□□ p□unds □ust □□ □th□n th□ □□□□r□t□□n r□n□□ □□r □□□□ s□□ p□□s□ Th□s□□ p□□ □n□□□□□d □□□ □ □d□□t□□□ □t□r □h□□h□ □□□□□s□□ p□□ □ust d□sp□□□ □□n□□ntr□t□□ns □□th□ h□□h□□□□□□t□r□□t □□□□ p□unds □ □□ R□□	D□□ut□ th□s□□ p□□ t□ □r□n□ th□ □□□□□□□□th□ h□□h□st □□n□□ntr□t□□n □□t□r□□t □□□□ p□unds □th□n th□ □□□□□r□t□□n r□n□□□□ □ s□□ p□□ d□sp□□□□n□ □□n□□ntr□t□□ns □□ target compounds ≤ 5× the RL that was □n□□□□□d □□□ □ □d□□t□□□ □t□r □h□□h□□□□□ s□□ p□□ □ust □□ r□□n□□□□□d□□□th□ r□sults d□n□t □□r□□ □th□n th□ R□□r□p□rt □n□□th□ s□□□nd □n□□s□s□

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Table 19
Per- and Polyfluoroalkyl Substances - Modified Methods
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
S□□ p□□ D□ut□□n □□r □nt□rn□□St□nd□rd T□□hn□□u□	□□□n□□nstru□ □nt □□n□□ntr□t□□n □□□□n□ □□□□ p□und □n □ s□□□ p□□ □□□□□□ds th□ □nstru□ □nt □□□□□□□□th□t □□□□ p□und □n th□ □ □st □□n□□ntr□t□d □n t□□□□ □□□□□r□t□□n st□nd□rd□th□ s□□□ p□□ □ust □□ d□ut□d t□ □ppr□□□□ □t□□□ □ d□□□□□□□□□th□ □□□□□r□t□□n r□n□□ □nd r□□n□□□□□d□ □th□ □□n□□ntr□t□□n □□th□t□r□□t □n□□t□ th□t □□□□□d□d th□ □□□□□r□t□□n r□n□□ □s pr□s□nt □n th□s□□□ p□□ □n□□□□□ □□□ □ □d□□t□□□ □t□r th□ h□□h□□ □□nt□□ □n□t□d s□□□ p□□ h□s □ □□n□□ntr□t□□n at a level ≤ 5× R□□th□n th□t s□□□ p□□ □ust □□ r□□n□□□□□d t□ d□t□r□ □n□ □□□□rr□□□□r □□□urr□d□	Th□ □nstru□ □nt □□□□□□□□□□□□ □□□□ p□unds □ust □□ □th□n th□ □□□□□r□t□□n r□n□□ □□r □□□□ s□□□ p□□s□ Th□s□□□ p□□ □n□□□□□d □□□ □ □d□□t□□□ □t□r □h□□h□ □□□□□s□□□ p□□ □ust d□sp□□□ □□n□□ntr□t□□ns □□th□ h□□h□□□□□□t□r□□t □□□□ p□unds □ □□□ R□□	D□ut□ th□s□□□ p□□t□ □r□n□ th□ □□□□□□□□□th□ h□□h□st □□n□□ntr□t□□n □□t□r□□t □□□□ p□unds □th□n th□ □□□□□r□t□□n r□n□□□□ □s□□□ p□□ d□sp□□□□n□ □□n□□ntr□t□□ns □□ target compounds ≤ 5× the RL that was □n□□□□□d □□□ □ □d□□t□□□ □t□r □h□□h□ □□□□□s□□□ p□□ □ust □□ r□□n□□□□□d□□□th□r□su□ts d□n□t □□r□□ □th□n th□ R□□r□p□rt □n□□th□ s□□□□nd □n□□□s□s□
M□nu□□□nt□□r□t□□ns	M□nu□□□nt□□r□t□□n □ □□□n□t □□ p□r□□r□ □d □□r th□ purp□s□ □□□□ □□t□n□ □□□□□r□t□□n □r □ □ □rt□r□□□	M□nu□□□nt□□r□t□□ns □ust □□ p□r□□r□ □d □n □□□□□rd□n□□ □th th□ □ss□□□□t□d □□□□□r□t□r□S□P□ M□nu□□□nt□□r□t□□ns □ust □□ r□□□□□□□d □nd □ppr□□□d □□ □ Sup□r□s□r□	□□□

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Table 20
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8280
Quality Control Requirements

Pr□□□dur□	□r□□u□n□□	□□□□pt□n□□ □rit□r□□	□□rr□□t□□□ □□t□□n
□h□□□ □□□nstru□ □nt tun□n□ us□n□ p□r□u□r□□□r□s□n□ □P□□□□	□t th□ □□□□□nn□n□ □nd □nd □□□ □□□r□ □□□h□ur sh□□t□	M□□t □ □n□□ u□ r□s□□□□n□ □□□□□ □□□□□□□	R□tun□ □nstru□ □nt D□n□t pr□□□□d □th □n□□□ss□s unt□P□□ □n□□□ss□s □ □□□ts □r□t□r□□
□ □nd□□ D□□□n□n□ M□□ □□ DM□	Pr□□r t□ □□□ □□ □nd □ □□ □□□□nd □□□h t□□ □ □d□ust□ □nts □r □ □□nt□n□n□□ □□t□□□t□□s □r□ p□r□□r□ □d th□t □ □□□ □□□□□t RTs□	□□n□□ □s□d t□ s□t RT □nd□□s□ ≤□□□□ □□□□□□□ □□t□ □□n □□□□ □□□□□□□4□T□DD □ □□□□ □□□□□□□□□T□DD	R□□d□ust □nd□□s R□n□□□t □ DM
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Table 20
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8280
Quality Control Requirements

Pr□□□dur□	□r□□u□n□□	□□□□pt□n□□ □ri□□r□□	□□rr□□t□□□ □□t□□n
M□th□d □□□n □M□□	□n□p□r □□t□h □□≤ □□ s□□ p□□s p□r □ □tr□□p□r □□n□□ntr□t□□n □□□□□□p□r d□□□Must und□r□□ □□□□ pr□p□r□t□□□ pr□□□dur□s□ □ M□ □ust □□ □n□□□□□d □t□r □□□h □ □ □□pr□□r t□s□□ p□□□ □n□□□s□s□	□nt□rn□□st□nd□rd □rt□r□□ □ □t□□r□□ □□ □nt□r□□r□n□□s□	□□p□s t□□□□ r□sul□s □n M□□th□n r□□□□tr□□t □n□ s□□ p□□s □th p□st□□□□ r□sul□s □ □□× M□ □□□□□□ □□r □ □DD □nd □ □× M□ □□□□□□□□r □□□□th□r □□□□ p□unds□ □□□MP□ □□□u□ □n M□□th□n r□pr□p □n□ s□□ p□□s □th □MP□ □□□u□ □ □□× M□ □□□□□□□□r □ □DD □nd □ □□ M□ □□□□□□□□r □□□□th□r □□□□ p□unds□ Run s□st□□ □□□n□□ □ss□ss □□ p□□t □n d□t□□ R□□n□□□□□□ R□□□□tr□□t □□t□h □s n□□□ss□r□□
□nt□rn□□St□nd□rds	□□□r□s□□ p□□□□□ □th□d □□□n□ □□S□MS□MSD□	□nt□rn□□st□nd□rd r□□□□□□r□ □□□□□□□□	R□□□□□u□t□ s□n□□t□ n□s□r□t□□□ R□□n□□□□□ □□tr□□t□ R□□□□tr□□t us□n□ □s□ □□□s□□ p□□ □□□□u□t □□ □ppr□pr□□t□□
M□tr□□ Sp□□□□ M□tr□□ Sp□□□ Dup□□□t□ □MS□MSD□	□n□p□r □□tr□□t□□n □□t□h p□r □ □tr□□p□r □□n□□ntr□t□□n □□□□□□ ≤ □□ s□□ p□□s p□r d□□□Must und□r□□ □□□s□□ p□□ pr□p□r□t□□□ pr□□□dur□s□Must □□ sp□□□d □th □□t□r□□t □n□□t□s □t □□n□□ntr□t□□ns □t □r n□□r th□ □ d□p□□nt □□th□ □□□□□r□t□□n r□n□□□	□□□□ R□□□□□□r□□s □th□n □□□□r□t□r□□□□n□r□t□d □□□ □ts□ □□RPDs □th□n □□□□r□t□r□□□□n□r□t□d □□□ □ts□	R□□□□□u□t□□ □ss□ss □□ p□□t □n d□t□□ R□□n□□□□□ □n□□□R□p□rt □□th s□ts□ □□□□□S r□□□□□r□ s□□□□pt□□□□r□p□rt □n□ □ut□□rs □n th□ □□s□ □□rr□t□□□□

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Table 20
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8280
Quality Control Requirements

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Table 20
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8280
Quality Control Requirements

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Table 20
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8280
Quality Control Requirements

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Table 20
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8280
Quality Control Requirements

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Table 21
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8290
Quality Control Requirements

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Table 21
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8290
Quality Control Requirements

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Table 21
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8290
Quality Control Requirements

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Table 21
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8290
Quality Control Requirements

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Table 21
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8290
Quality Control Requirements

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Table 21
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans - SW-846 Method 8290
Quality Control Requirements

[illegible] required when MS/MSD [illegible] [illegible] [illegible]

Table 22
Chlorinated Biphenyl Congeners - US EPA Method 1668
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Table 22
Chlorinated Biphenyl Congeners - US EPA Method 1668
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Table 22
Chlorinated Biphenyl Congeners - US EPA Method 1668
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
[illegible]	[illegible]	%RSD≤20 [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

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Table 22
Chlorinated Biphenyl Congeners - US EPA Method 1668
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Table 22
Chlorinated Biphenyl Congeners - US EPA Method 1668
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Table 22
Chlorinated Biphenyl Congeners - US EPA Method 1668
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Table 22
Chlorinated Biphenyl Congeners - US EPA Method 1668
Quality Control Requirements

Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
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Table 22
Chlorinated Biphenyl Congeners - US EPA Method 1668
Quality Control Requirements

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Table 23
Phenolics, Total Recoverable - SW-846 Method 9066 & US EPA Method 420.4
Quality Control Requirements

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Table 23
Phenolics, Total Recoverable - SW-846 Method 9066 & US EPA Method 420.4
Quality Control Requirements

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Continuing Calibration Verification	At the beginning of the analytical run, after every 10 analytical samples, and at the end of the analytical run.	Recovery must be within ±10% of the true value.	Recalculate the results if an error in calculation is found. Inspect the instrument for possible problems. Repeat the calibration procedure and reanalyze the affected samples. Corrective action is required when the check fails high and the sample results are not flagged.
Continuing Calibration Verification for Low Level	After every 10 analytical samples.	Recovery must be within ±30% of the true value.	Recalculate the results if an error in calculation is found. Inspect the instrument for possible problems. Repeat the calibration procedure and reanalyze the affected samples. Corrective action is required when the check fails high and the sample results are not flagged. Report in the case narrative any sample results that do not meet this criteria.
Interference Check Sample (ICS)	Interference check standards (ICSA and ICSAB) must be run at the beginning of the analytical run and after every 8 hours of analysis, at the end of the analytical run, or as often as needed to verify the laboratory's interference correction factors.	Results must be within ±20% of the true value.	Terminate the analysis if the criteria are not met. Reanalyze the ICS and all samples analyzed since the last successful ICS. Samples not bracketed by successful ICS analyses must be reanalyzed or the data flagged.

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Calibration Verification Standards	One per calibration curve and after every 10 samples	Within ± 10% of the true value. Must be prepared from a source different than the calibration standards.	Recalibrate and reanalyze affected samples.
Method Blank	One per batch of ≤ 20 samples	Below the reporting limit. Must be prepared with the batch.	Identify and eliminate the source of contamination. Reanalyze affected samples.
Laboratory Control Sample (LCS)	One per batch of 20 samples	Within 80-120% of the true value.	Recalibrate and reanalyze affected samples.
Matrix Spike (MS)	One per batch of 20 samples	Within 75-125% recovery.	If the LCS is acceptable, flag the MS results.
Matrix Spike Duplicate (MSD)	One per batch of 20 samples	Within 75-125% recovery and ≤ 20% RPD between MS and MSD.	If the LCS is acceptable, flag the MS/MSD results.
Serial Dilution	One per batch of 20 samples	Within 10% of the undiluted result.	Flag the results.
Internal Standards	Every sample, blank, and QC sample	Within 60-125% of the calibration standard.	Reanalyze affected samples.
Interference Check Standard (ICS)	Beginning of each analytical run	Within ± 20% of the true value.	Recalibrate and reanalyze affected samples.
Reporting Limit Verification	Quarterly	Within 50-150% of the true value.	Flag the results.
Linear Dynamic Range (LDR) Verification	Annually	Within ± 10% of the true value.	Flag the results.
Method Detection Limit (MDL) Study	Annually	Per 40 CFR Part 136, Appendix B.	Flag the results.
Standard Reference Materials (SRMs)	One per batch of 20 samples	Within 80-120% of the certified value.	Recalibrate and reanalyze affected samples.
Duplicate	One per batch of 20 samples	≤ 20% RPD between the original and duplicate results.	Flag the results.
Post-Digestion Spike	When matrix interference is suspected	Within 75-125% recovery.	Flag the results.
Method of Standard Additions (MSA)	When matrix interference is severe	Per 40 CFR Part 136, Appendix B.	Flag the results.
Sample Preservation	Every sample	Per 40 CFR Part 136, Table II.	Reject the sample.
Holding Time	Every sample	Per 40 CFR Part 136, Table II.	Reject the sample.
Chain of Custody	Every sample	Per 40 CFR Part 136, Table II.	Reject the sample.
Data Review	Every batch	Per 40 CFR Part 136, Table II.	Reject the sample.
Corrective Action Report	Every batch	Per 40 CFR Part 136, Table II.	Reject the sample.
Training	Annually	Per 40 CFR Part 136, Table II.	Reject the sample.
Proficiency Testing	Annually	Per 40 CFR Part 136, Table II.	Reject the sample.
Audit	Annually	Per 40 CFR Part 136, Table II.	Reject the sample.
Management Review	Annually	Per 40 CFR Part 136, Table II.	Reject the sample.

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Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Spike additions	With the instrument calibration verification standards (ICVS) and continuing calibration verification standards (CCVS) as specified in the analytical run sequence with the instrument calibration blank (ICB) when a single point calibration is used. This spike must be diluted and reanalyzed.	The instrument calibration verification standards (ICVS) and continuing calibration verification standards (CCVS) and blanks (ICB and CCB) must be within the control limits specified in the analytical run sequence when a single point calibration is used.	Dilute the sample portion from the target analyte(s) found in the original analysis and reanalyze.
	For multiple point calibrations with the instrument calibration verification standards (ICVS) and continuing calibration verification standards (CCVS) and blanks (ICB and CCB) as specified in the analytical run sequence.	The instrument calibration verification standards (ICVS) and continuing calibration verification standards (CCVS) and blanks (ICB and CCB) must be within the control limits specified in the analytical run sequence when a single point calibration is used.	Dilute the sample portion from the target analyte(s) found in the original analysis and reanalyze.
Quantitation Issues	For each analyte in each sample, standard, and quality control sample.	The RSD must be ≤ 5%	When the RSD is > 5% perform the Corrective Action in the Reporting section. Report the results for the associated samples.

Notes:

- Calibrations must be prepared with the matrix specified and at the pH specified in the analytical procedure. Samples must be digested and reported at the same dilution as the calibration standards unless dilutions are performed to bring the concentration of the analyte within the calibrated range of the instrument. Samples must be diluted to bring the concentration of the analyte within the calibrated range of the instrument. Samples must be diluted to bring the concentration of the analyte within the calibrated range of the instrument. The dilution must be performed using the same type of acid and at the same concentration as in the calibration standards. The same dilution of the appropriate blank must be added to the samples.

- Correlation coefficients for calibration when used to report concentrations in the samples must be greater than 0.995. Calibration curves must be verified using at least one standard at the reporting limit (RL) or lower. The RL must be verified by analysis of a standard at the RL or lower. The RL must be adjusted for sample dilution, sample size, and percent moisture, as applicable.

- Control limits for spike recoveries, duplicate precision, and laboratory control samples (LCS) are listed in the Quality Control Limits section. Laboratory control samples must be prepared using a standard obtained from a source different from the source of the calibration standards. The LCS must be prepared using the same type of acid and at the same concentration as in the calibration standards. The LCS must be analyzed using the same sample introduction system as the samples. Refer to the Quality Control Limits section.

- Matrix spikes should be performed at the frequency specified in the analytical procedure or at a minimum of one per analytical batch. Matrix spikes must be performed on a sample matrix that is representative of the batch. If more than one sample in a batch is used for matrix spikes, the second spike addition should be at a different concentration than the first spike addition. The concentration of the spike should be based on anticipated sample concentrations, or on the regulatory compliance limits. If sample concentrations are not known, spike concentrations should be based on the instrument calibration. If the spike concentration is not known, spike concentrations should be based on the instrument calibration. If the spike concentration is not known, spike concentrations should be based on the instrument calibration.

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

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Table 24
Metals by ICP-AES – SW-846 Method 6010 and US EPA Method 200.7
Quality Control Requirements

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Table 25
Metals by ICP/MS – SW-846 Method 6020 and US EPA Method 200.8
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Mass Calibration and Resolution Checks	Mass calibration and resolution must be checked daily. Mass calibration must be verified after any adjustment is made to the instrument tuning parameters.	Mass calibration must be within 0.1 amu of the true values. Resolution must be adequate to resolve 1 amu peaks with a valley ≤ 10% of peak height. Resolution must be verified to be less than 0.9 amu and greater than 0.75 amu wide at 5% peak height.	Mass calibration must be corrected before any samples are run. Instrument is recalibrated and verified.
Initial Calibration	Once per 24 hours and each time the instrument is set up. The calibration curve using the calibration standards and a calibration blank must be run.	The correlation coefficient for each analyte must be ≥ 0.998. For a multipoint calibration the RSD for the standards must be ≤ 20% and the deviation from the true value must be ≤ 30%.	Unacceptable standard or curve must be rerun. Unacceptable analytes must be reprepared and the instrument calibration must be verified.
Initial Calibration Verification	Once per 24 hours and each time the instrument is recalibrated after the analysis of the initial calibration blank.	Recovery must be within ±10% of the true value.	Reanalyze the ICV. If still outside limits, prepare a fresh standard and recalibrate.

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Table X
Metals by ICP/MS – SW-846 Methods 6020, 6020A, and 6020B and US EPA Method 200.8
Quality Control Requirements

Quality Control	Frequency	Description	Criteria
Initial Calibration Verification	Once after each calibration	Analyzed after the calibration standards	Results must be within the acceptance criteria for the analytes in the standard
Calibration Blank	Run at the beginning of the run after the ICV and after the highest calibration standard.	This sample is used to demonstrate that carryover from the previous sample is not present above the reporting limit.	Results must be less than the reporting limit.
Continuing Calibration Verification and Continuing Calibration Blank	Run at the beginning of the run, after every 10 samples, and at the end of the run sequence.	This sample is used to demonstrate that the instrument is in calibration throughout the run sequence.	Results must be within the acceptance criteria for the analytes in the standard.
Laboratory Duplicate	One per batch of samples.	Duplicate of a sample in the batch.	Results must be within the acceptance criteria for the analytes in the standard.

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Metals by ICP/MS – SW-846 Methods 6020, 6020A, and 6020B and US EPA Method 200.8
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Continuing Calibration Verification	A CCV must be run at the beginning and end of each analytical run or every 10 analytical samples, whichever is more frequent.	Recoveries must be within 90-110% of the true value.	Recalculate the data if an error is found. Reanalyze the CCV and all samples analyzed after the last acceptable CCV. If the problem persists, perform instrument maintenance and recalibrate. Reanalyze the CCV and all samples analyzed after the last acceptable CCV. Corrective action is not required for analytes not detected in the associated samples.
Continuing Calibration Verification	One CCV per analytical batch.	Results for samples analyzed between the last acceptable CCV and a failing CCV must be reanalyzed.	Recalculate the data if an error is found. Reanalyze the CCV and all samples analyzed after the last acceptable CCV. If the problem persists, perform instrument maintenance and recalibrate. Reanalyze the CCV and all samples analyzed after the last acceptable CCV. Corrective action is not required for analytes not detected in the associated samples. Report in case narrative if reanalysis of samples is not performed.
Internal Standards	Internal standards must be added to every blank, standard, sample, MS, and MSD run. Check the internal standard response and retention time for every sample, MS, MSD, blank, and standard.	Internal standard response must be within 60-125% of the response in the most recent calibration blank. Retention time must be within 30 seconds of the retention time in the most recent calibration blank. MS/MSD is not required for internal standard results.	Check the sample preparation for errors. Reanalyze the sample if no errors are found. If the problem persists, perform instrument maintenance and recalibrate. Reanalyze the sample and all samples analyzed after the last acceptable internal standard.

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Quality Control Requirements

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Metals by ICP/MS – SW-846 Methods 6020, 6020A, and 6020B and US EPA Method 200.8
Quality Control Requirements

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Metals by ICP/MS – SW-846 Methods 6020, 6020A, and 6020B and US EPA Method 200.8
Quality Control Requirements

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Quality Control Requirements

Quality Control	Frequency	Description	Corrective Action
Internal Standards (IS)	Every sample, standard, and blank	The internal standard concentration should be consistent in the calibration standards, samples, and QC samples.	If the internal standard response is outside the laboratory established acceptance limits, see the instrument manufacturer's recommended corrective action. If the internal standard response in the associated samples is outside the laboratory established acceptance limits, see the instrument manufacturer's recommended corrective action. Dilution of samples may be required.
Post Digestion Spike (PDS)	Must be performed for MS/MSD failures.	Recoveries should be within laboratory established limits. If the PDS fails, the associated samples must be reanalyzed by the method of additions.	If the sample concentration is less than 4 times the spiking level, the PDS should be performed at a concentration at least equal to the native sample concentration.
Serial Dilution	Must be performed for each matrix.	If the analyte concentration is sufficiently high (minimally, a factor of 10 dilution must give a measurable result), an analysis of a 5-fold dilution must agree within ± 10% of the original determination.	If the analyte concentration is sufficiently high, dilute and reanalyze the sample.

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Quality Control Requirements

Quality Control	Requirement	Description	Corrective Action
Spike Compounds	At the instrument manufacturer's recommendation, tune to meet the instrument manufacturer's specifications for the analytes listed in the method.	The instrument manufacturer's tune solution must contain analytes and internal standards that cover the entire mass range.	Document that this step is performed at the frequency specified in the method. Document that the instrument manufacturer's specifications are met when a single point calibration is used.
	Prior to calibration and every 12 hours thereafter, the instrument manufacturer's tune solution must be analyzed to demonstrate that the instrument manufacturer's specifications are met when a single point calibration is used.	The instrument manufacturer's tune solution must contain analytes that cover the entire mass range.	Document that this step is performed at the frequency specified in the method. Document that the instrument manufacturer's specifications are met when a multipoint calibration is used.
Quality Control Issues	Prior to sample analysis, a multipoint calibration must be performed as specified in the method.	A blank and at least three calibration standards must be used.	When the criteria are not met, perform corrective action, recalibrate, and verify the results for the previous successful calibration.

Notes:

- Various sample types must be processed with a method blank of similar matrix. For example, a soil sample must be processed with a method blank that is a clean sand or other inert solid. Aqueous samples must be processed with reagent water. Method blanks must be taken through the entire analytical procedure, including preparation and analysis. Method blanks must be processed at a frequency of at least 1 per 20 samples or per batch, whichever is more frequent.

- Prior to analysis, each laboratory must demonstrate an initial demonstration of capability (IDC) for each analyte of interest. The IDC must be performed using four replicate samples that are prepared and analyzed according to the method. The mean recovery and standard deviation of the four values must be calculated and compared to the acceptance criteria specified in the method.

- Control limits are developed by each laboratory for each analyte of interest. Control limits are typically ± 3 standard deviations around the mean recovery. Control limits must be developed using a minimum of 20 to 30 data points. Control limits must be updated periodically as more data points become available.

- Internal standards are added to every blank, sample, and QC sample in a known amount. The internal standard response is monitored to assess instrument performance. Internal standard responses in samples are compared to the internal standard response in the calibration standard. The EPA specifies that internal standard responses should not deviate more than 30% from the calibration standard response. Alternatively, laboratories may develop their own control limits based on historical data.

- The CCV and MS/MSD should be spiked at the same concentration as the mid-point calibration standard. The CCV must be prepared using a second source standard. The MS/MSD must be prepared using a different lot of reagents than the calibration standards.

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Quality Control Requirements

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Quality Control Requirements

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Table 26
Mercury – SW-846 Methods 7470 and 7471 and US EPA Method 245.1
Quality Control Requirements

Quality Control Sample	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration Verification	Once per 24 hours and each time the instrument is set up. Initial calibration consists of a calibration blank and three calibration standards.	Criteria for the initial calibration verification must be met before any samples are analyzed.	Corrective action must be taken and documented before the instrument is recalibrated and verified. Recalibration procedures and criteria must be documented in the laboratory's SOP.
Initial Calibration Verification for Preparation Methods	Once per 24 hours and each time the instrument is set up. Initial calibration consists of a calibration blank and three calibration standards.	4 for 7470 and 4 for 7471 or as specified in the laboratory's SOP. 4 for 7470 or as specified in the laboratory's SOP. The result must be within the laboratory established acceptance limits for the specific analyte.	Corrective action must be taken and documented before the instrument is recalibrated and verified. Recalibration procedures and criteria must be documented in the laboratory's SOP. Corrective action is not required when the concentration is greater than the concentration specified in the laboratory's SOP, or when sample volume is insufficient to perform the reanalysis.
Continuing Calibration Verification	Must be analyzed after every 10 samples. Must be analyzed at the end of the analytical run.	4 for 7470 and 4 for 7471 or as specified in the laboratory's SOP. 4 for 7470 or as specified in the laboratory's SOP. The result must be within the laboratory established acceptance limits for the specific analyte.	Corrective action must be taken and documented before the instrument is recalibrated and verified. Recalibration procedures and criteria must be documented in the laboratory's SOP. Corrective action is not required when the concentration is greater than the concentration specified in the laboratory's SOP, or when sample volume is insufficient to perform the reanalysis.
Laboratory Fortified Blank	Must be analyzed after every 10 samples. Must be analyzed at the end of the analytical run.	4 for 7470 and 4 for 7471 or as specified in the laboratory's SOP. 4 for 7470 or as specified in the laboratory's SOP. The result must be within the laboratory established acceptance limits for the specific analyte.	Corrective action must be taken and documented before the instrument is recalibrated and verified. Recalibration procedures and criteria must be documented in the laboratory's SOP. Corrective action is not required when the concentration is greater than the concentration specified in the laboratory's SOP, or when sample volume is insufficient to perform the reanalysis.
Laboratory Fortified Blank Duplicate or Matrix Spike Duplicate	Must be analyzed after every 10 samples. Must be analyzed at the end of the analytical run.	4 for 7470 and 4 for 7471 or as specified in the laboratory's SOP. 4 for 7470 or as specified in the laboratory's SOP. The result must be within the laboratory established acceptance limits for the specific analyte.	Corrective action must be taken and documented before the instrument is recalibrated and verified. Recalibration procedures and criteria must be documented in the laboratory's SOP. Corrective action is not required when the concentration is greater than the concentration specified in the laboratory's SOP, or when sample volume is insufficient to perform the reanalysis.

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Table 26
Mercury – SW-846 Methods 7470 and 7471 and US EPA Method 245.1
Quality Control Requirements

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Table 26
Mercury – SW-846 Methods 7470 and 7471 and US EPA Method 245.1
Quality Control Requirements

Quality Control Sample	Frequency	Acceptance Criteria	Corrective Action
Method Preparation Batch	One per batch of ≤ 20 samples per matrix per day Must undergo the same preparation processes (*e.g.*, digestion)	Must be the Reagent Blank (RB) processed through the specified steps with the associated samples and results which meet the requirements	As specified by the method, but at a minimum the batch must be reprepared and reanalyzed
Laboratory Control Sample (LCS)	One per batch Must undergo the same preparation processes (MB) as the associated samples	Within laboratory control limits	Terminate analysis; locate and eliminate problem; reprepare and reanalyze samples analyzed since last in control LCS and not confirmed by subsequent analyses
Matrix Spike (MS)	One per batch per matrix	Within laboratory control limits	Flag data
Matrix Spike Duplicate (MSD)	One per batch per matrix	Within laboratory control limits	Flag data
Laboratory Duplicate	One per batch per matrix	RPD ≤ 20% (when sample concentration is greater than 5 times the LOQ)	Flag data

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Table 26
Mercury – SW-846 Methods 7470 and 7471 and US EPA Method 245.1
Quality Control Requirements

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Table 26
Mercury – SW-846 Methods 7470 and 7471 and US EPA Method 245.1
Quality Control Requirements

Quality Control Sample	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per batch of ≤ 20 samples per matrix per duration Must undergo same analysis as parent project duration (e.g. digestion) Must not be performed on diluted sample or sample duplicate	Recoveries must be used in parent sample 4× spike concentration or RPD ≤ 20 for precision. Control limits must be used in parent sample otherwise control limits or in house limits	Analyst must assess impacted data and report using professional judgment in the absence of corrective action
Laboratory Duplicate	One per batch of ≤ 20 samples per matrix per duration Must undergo same analysis as parent project duration (e.g. digestion) Must not be performed on diluted sample or sample duplicate	RPD ≤ 20 for analytes results when both results are ≥ 5× the RL or duplicate control limits if RPD is ≤ the RL For spiked results RPD ≤ 20 when both results are ≥ 5× the RL or duplicate control limits if RPD is ≤ 5× the RL	Analyst must assess impacted data and report using professional judgment in the absence of SOP corrective action
Post digestion Spike	Required for analysis by graphite furnace AA when MS/MSD recoveries fall outside the 75-125% control limits	Control limits must be used in the same matrix	Method of standard additions must be used for analysis in the batch
Reagent Blank	Reported per analytical run or 20 samples, whichever is more frequent	≤ RL	If the concentration in the blank exceeds the RL or project-specified DQO, report the results for the affected samples

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Table 26
Mercury – SW-846 Methods 7470 and 7471 and US EPA Method 245.1
Quality Control Requirements

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Table 26
Mercury – SW-846 Methods 7470 and 7471 and US EPA Method 245.1
Quality Control Requirements

- MS/MSD/D/P samples must be prepared and analyzed with the project samples.

- The method specified in the standard operating procedure for MS/MSD analysis must be used for the analysis of samples for the project. This typically requires that MS/MSD samples be processed through the entire analytical procedure. The MS/MSD sample preparation frequency must be documented and should be one per analytical batch of 20 samples or fewer of similar matrix.

- When the MS/MSD samples are prepared from samples collected in the field, sufficient sample volume must be collected to perform the analysis. Insufficient sample volume may result in the inability to perform the MS/MSD analysis.

- The concentration of the spiking solution should be at the same level as the matrix spike concentration. The spiking solution should be prepared from a source different from the source of the calibration standards.

- Matrix spike recoveries must be reported for all analytes. The recovery should be within the laboratory-generated control limits. If the recovery is outside the control limits, and the laboratory performance is in control, the problem is judged to be matrix related.

- The laboratory must analyze duplicates of samples. The relative percent difference (RPD) should not be calculated when the sample concentration is less than five times the reporting limit.

- Calibration must be performed using the matrix-specific calibration standards.

- Blanks must not be reported when contamination is not detected.

- Any deviations from the above requirements must be documented in the case narrative and reported.

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Table 27
Mercury, Low Level – US EPA Method 1631E
Quality Control Requirements

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Quality Control Requirements

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Mercury, Low Level – US EPA Method 1631E
Quality Control Requirements

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Table 27
Mercury, Low Level – US EPA Method 1631E
Quality Control Requirements

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Table 28
Total Organic Carbon – SM 5310B & SW-846 Method 9060
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration Verification (ICV) and Initial Calibration Blank (ICB)	Daily Must be run on each instrument used to run the RSK-175 analysis Option (ICV): Analyze a mid-point upper and lower concentration standard that is from a source different than the RSK-175 calibration standards	Correlation coefficient of ≥ 0.995 for the calibration curve. Recalculate the concentration of the calibration standards to verify the RSK-175 calibration standards are within 4 0% s n t o t th R Must be re-established every 4 hours. This process must be repeated until calibration verification results are obtained.	Reanalyze ICV and ICB. If continuing calibration verification results are not obtained, perform maintenance to the instrument, and recalibrate.
Method Blank (MB)	One per analytical batch or per 20 samples, whichever is more frequent. Must be run as a sequential method blank	Below the reporting limit (RL)	Correct source of contamination and reanalyze batch of samples back to the previous acceptable blank.
Initial Calibration Verification (ICV)	After each initial calibration. Must be run as a sequential method blank	≤ the RL	Reanalyze ICV and recalibrate if necessary. Samples cannot be reported based on a failing ICV. Samples must be re-analyzed in the next analytical batch.

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Table 28
Total Organic Carbon – SM 5310B & SW-846 Method 9060
Quality Control Requirements

Quality Control	Frequency	Description	Corrective Action
Continuing Calibration Verification	Method Blank at the beginning of the analytical run after the calibration curve and after every 10 samples and at the end of the run. Samples must be preceded and followed by a successful CCV and CCB. Method Blank at the beginning of the analytical run after the calibration curve and after every 10 samples and at the end of the run. Samples must be preceded and followed by a successful CCV and CCB.	Calibration Verification	Reanalyze Calibration Verification or prepare new standards and reanalyze. Samples must be bracketed by acceptable CCV and CCB
Continuing Calibration Verification	One per batch of ≤ 20 samples	≤ the RL	Reanalyze Calibration Verification or prepare new standards and reanalyze. Samples must be bracketed by acceptable CCV and CCB. Results for samples not bracketed by acceptable CCV and CCB is reported with a flag.
Method Blank	One per batch of ≤ 20 samples per matrix per analytical run	≤ the RL	Reanalyze Blank and reanalyze samples processed with unacceptable blank, unless sample results are greater than 10 times the blank concentration. Must bracket samples with acceptable blank.

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Table 28
Total Organic Carbon – SM 5310B & SW-846 Method 9060
Quality Control Requirements

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Table 28
Total Organic Carbon – SM 5310B & SW-846 Method 9060
Quality Control Requirements

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Table 28
Total Organic Carbon – SM 5310B & SW-846 Method 9060
Quality Control Requirements

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Table 29
Anions by IC - SW-846 Method 9056 & US EPA Method 300.0
Quality Control Requirements

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Table 29
Anions by IC - SW-846 Method 9056 & US EPA Method 300.0
Quality Control Requirements

Quality Control Element	Frequency	Acceptance Criteria	Corrective Action
Method Detection Limits	Annually or as needed	Not applicable	Not applicable
Continuing Calibration Verification	At the beginning and end of the analytical run sequence or every 10 samples and at the end of the analytical run	Recoveries and relative standard deviations must meet the most stringent applicable criteria	Corrective action is not required unless the criteria is not met. If not met, the system must be investigated and samples bracketed by the failing CCV must be reanalyzed
Continuing Calibration Verification - Low Level	After each calibration and at the end of the analytical run sequence	Recoveries must meet the most stringent applicable criteria	Corrective action is required unless the criteria is met. If not met, the system must be investigated and samples bracketed by the failing CCV must be reanalyzed
Reporting Limit Verification (RLV)	At the beginning and end of the analytical run sequence	Recoveries must meet the most stringent applicable criteria	Corrective action is required unless the criteria is met. If not met, the system must be investigated and samples bracketed by the failing RLV must be reanalyzed
Method Blank	One per batch of ≤ 20 samples per matrix per analytical batch. Must undergo the same preparation and analysis	Less than the MDL	Recommended if criteria not met. Samples may be reported with qualifiers if blank contamination is below the regulatory limit

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Anions by IC - SW-846 Method 9056 & US EPA Method 300.0
Quality Control Requirements

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Anions by IC - SW-846 Method 9056 & US EPA Method 300.0
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike (MS)	One per batch of ≤ 20 samples per matrix per method 9056A: One per batch of ≤ 20 samples per matrix per method Must under follow project procedures	Recovery within laboratory derived limits Control limits must be used in place of the default limits if they are more stringent than the default limits	Analyst to notify project manager and report in the case narrative MS/MSD recoveries for target analytes not applicable for QC assessment as the native concentration is 4 times the spike concentration
Matrix Spike Duplicate (MSD)	**300.0** One per batch of ≤ 20 samples per matrix per method Must under follow project procedures	**300.0: 20% RPD.** Control limits must be used in place of the default limits if they are more stringent than the default limits	Analyst to notify project manager and report in the case narrative MS/MSD recoveries for target analytes not applicable for QC assessment as the native concentration is 4 times the spike concentration

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Quality Control Sample	Frequency	Acceptance Criteria	Corrective Action
Quality Control Sample Initial Calibration Verification	With the instrument calibration curve for target analytes and surrogates as specified in the calibration section of this SOP and before sample analysis.	The instrument calibration curve must be verified before sample analysis. This QC sample consists of a mid-level calibration standard prepared from a source different than the calibration standards and at a concentration near the middle of the calibration range. With the calibration verification, the percent recovery for target analytes must be within ±10% of the true value.	During the sample preparation and analysis, if target analytes are detected above the MRL, the results must be flagged and reported.
Method Blank	With the instrument calibration curve for target analytes and surrogates as specified in the calibration section of this SOP and before sample analysis.	The method blank must not contain target analytes at concentrations greater than ½ the MRL or ½ the regulatory limit, whichever is lower.	Re-prepare and re-analyze the method blank and all samples processed with a contaminated method blank.
Matrix Interference	Matrix interference is not required for the purpose of demonstrating method performance.	Matrix interference must be performed in accordance with the laboratory SOP for the analysis of SPC.	None

Notes:

- Sample weights and volumes must be recorded and must be proportional to the weight and volume used in the calibration standards.
- For duplicate samples, the RPD should not be calculated when the sample and duplicate results are less than the RL.
- MS and MSD must be analyzed using the same test methods and procedures as applied for the associated samples.

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Anions by IC - SW-846 Method 9056 & US EPA Method 300.0
Quality Control Requirements

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Table 30
Table 30 Cyanide - SM 4500CN E, SW-846 Methods 9012 & 9014, & US EPA Method 335.4
Quality Control Requirements

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Table 30
Table 30 Cyanide - SM 4500CN E, SW-846 Methods 9012 & 9014, & US EPA Method 335.4
Quality Control Requirements

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Table 30 Cyanide - SM 4500CN E, SW-846 Methods 9012 & 9014, & US EPA Method 335.4
Quality Control Requirements

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Table 30
Table 30 Cyanide - SM 4500CN E, SW-846 Methods 9012 & 9014, & US EPA Method 335.4
Quality Control Requirements

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Table 31
Radiochemical Parameters by Liquid Scintillation
Quality Control Requirements

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Table 31
Radiochemical Parameters by Liquid Scintillation
Quality Control Requirements

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Table 31
Radiochemical Parameters by Liquid Scintillation
Quality Control Requirements

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Table 32
Radiochemical Parameters by Gas Flow Proportional Counter
Quality Control Requirements

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Table 32
Radiochemical Parameters by Gas Flow Proportional Counter
Quality Control Requirements

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Table 32
Radiochemical Parameters by Gas Flow Proportional Counter
Quality Control Requirements

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Table 32
Radiochemical Parameters by Gas Flow Proportional Counter
Quality Control Requirements

Notes:

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Table 33
Radiochemical Parameters by Gamma Spectrometry
Quality Control Requirements

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Table 33
Radiochemical Parameters by Gamma Spectrometry
Quality Control Requirements

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Table 33
Radiochemical Parameters by Gamma Spectrometry
Quality Control Requirements

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Table 34
Radium-226 and Radium-228 by Gamma Spectrometry – Georgia Institute of Technology
Quality Control Requirements

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Table 34
Radium-226 and Radium-228 by Gamma Spectrometry – Georgia Institute of Technology
Quality Control Requirements

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Table 34
Radium-226 and Radium-228 by Gamma Spectrometry – Georgia Institute of Technology
Quality Control Requirements

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Table 34
Radium-226 and Radium-228 by Gamma Spectrometry – Georgia Institute of Technology
Quality Control Requirements

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Table 35
Radiochemical Parameters by Alpha Spectrometry
Quality Control Requirements

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Table 35
Radiochemical Parameters by Alpha Spectrometry
Quality Control Requirements

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Table 35
Radiochemical Parameters by Alpha Spectrometry
Quality Control Requirements

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Table 35
Radiochemical Parameters by Alpha Spectrometry
Quality Control Requirements

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Table 36
Radium-226 by Radon Emanation Technique – SM7500Ra C
Quality Control Requirements

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Table 36
Radium-226 by Radon Emanation Technique – SM7500Ra C
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD)	One per matrix per batch with ≤ 20 samples or per day when batch is larger. Must undergo the same preparation and analysis	Laboratory shall use TNI or state program established acceptance criteria, if applicable. If not specified, 40% RPD for duplicates.	Matrix spike results may be impacted by native sample concentration. Flag data if MS/MSD recoveries are outside acceptance limits due to matrix effects.
Laboratory Duplicate or Matrix Spike Duplicate (MSD)	One per matrix per batch with samples (*i.e.*, 5% of batch) when batch is larger. Must undergo the same preparation and analysis	Laboratory shall use TNI or state program established acceptance criteria, if applicable. If not specified, 40% RPD for duplicates.	Laboratory shall use TNI or state program established acceptance criteria, if applicable. If not specified, 40% RPD for duplicates.
Check Standard or Laboratory Control Sample (LCS)	Analyze with each batch	Recovery within 80-120%	Recount to confirm. Report data from second count unless sample concentration is greater than 4 times the spike concentration.
Quality Control Samples	Quarterly	Report results to data user	Report the true value, the laboratory's result and control limits.
Method Detection Limit (MDL)	Annually	Study shall be performed according to the most recent version of 40 CFR Part 136, Appendix B	Report the true value, the laboratory's result and control limits.

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Table 36
Radium-226 by Radon Emanation Technique – SM7500Ra C
Quality Control Requirements

Notes:

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Table 37
Ignitability - US EPA Methods 1010, 1020, &1030
Quality Control Requirements

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Table 38
Solids – SM 2540 and US EPA 160.1
Quality Control Requirements

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Table 38
Solids – SM 2540 and US EPA 160.1
Quality Control Requirements

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Table 38
Solids – SM 2540 and US EPA 160.1
Quality Control Requirements

Notes:

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Table 39
Hexane Extractable Materials & Silica-Gel Treated-Hexane Extractable Materials - SW-846 Method 9071B & US EPA Method 1664
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Analytical Balance Calibration	Perform a 2-point (2 mg and 1000 mg) calibration check before and after every analytical batch.	Calibrations must be verified within 10% at 2 mg and 0.5% at 1000 mg.	Recalibrate balance and reweigh weights. If still out, balance may require service.
Quality Control Sample (QCS)	Monthly for laboratories performing routine analyses; less frequently for laboratories performing analyses sporadically. QCS should be from a source different than the hexadecane and stearic acid used routinely for analysis.	40 ± 1 mg must be recovered from 10.0 ± 0.1 mL of solution.	Determine root cause and correct. Prepare fresh solution if needed. A successful QCS result must be achieved before extracting and analyzing further field samples.
Method Blank	One per batch of ≤ 20 samples per matrix per day. Must undergo all sample preparative procedures.	Blank results < ½ RL. If results are reported to the MDL the blank must be < MDL.	If the blank result is greater than ½ the RL or MDL (depending on reporting requirements), the source of contamination must be identified and eliminated. Re-extract and reanalyze samples associated with a contaminated method blank. Each analytical sample must be associated with a method blank free of contamination. Corrective action is not required if sample concentration is > 10× the blank level or if positive result is reported for the blank but the analyte is “not-detected” in the sample.
Laboratory Control Sample (LCS)/Ongoing Precision and Recovery (OPR) standard	One per batch of ≤ 20 samples per matrix per day. Must undergo all sample preparative procedures.	HEM 78-114% recovery. SGT-HEM 64-132% recovery.	Check calculations and spike preparation for documentable errors. If the recovery is outside criteria, the analytical process is not in control, and the analytical batch must be reextracted and reanalyzed unless the LCS recovery is high and the analyte is “not-detected” in the sample.

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Table 39
Hexane Extractable Materials & Silica-Gel Treated-Hexane Extractable Materials - SW-846 Method 9071B & US EPA Method 1664
Quality Control Requirements

Quality Control Item	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per batch of ≤ 20 samples per matrix per day from each discharge/waste stream. Must undergo all sample preparative procedures. MSD recommended, but not required. RPD calculated between MS/MSD results, not recoveries.	HEM 78-114% recovery. SGT-HEM 64-132% recovery. HEM RPD <18%. SGT-HEM RPD < 34%.	If LCS is within criteria, matrix interference is present and the laboratory must assess the potential cause of interference. If the LCS is outside acceptance criteria, the analytical system is judged to be out of control, and the problem must be identified and corrected. The entire sample batch must be reanalyzed. MS/MSD recovery criteria are not applicable if sample concentration is > 4× the spike concentration. If the RPD criteria are not met, the analytical system is judged to be out of control, and the problem must be identified and corrected. The entire sample batch must be reanalyzed.
Qualitative/ Quantitative Issues	The weight of the analyte must not exceed the upper balance calibration range.	The instrument level of all target compounds must be within the calibration range.	Take a smaller aliquot of sample and reanalyze.

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Table 39
Hexane Extractable Materials & Silica-Gel Treated-Hexane Extractable Materials - SW-846 Method 9071B & US EPA Method 1664
Quality Control Requirements

Notes:

- The sample pH shall be checked just prior to sample analysis in accordance with Section 11.2.1 of the analytical method. It shall not be checked at sample receipt.

- The entire sample volume must be quantitatively transferred to the extraction vessel during testing. The sample volume must be measured and recorded to the nearest 1 mL.

- Sample weights must be bracketed by the balance calibration range.

- When the balance is not directly linked to LIMS, weights must be recorded in a bound logbook and photocopies of the logbook pages must be included in the data deliverables.

- All lot numbers of acids, prepared (or neat) reagents, spiking solutions, initial calibration and efficiency check standards, and consumables (*e.g.,* filter paper, syringes, centrifuge tubes, *etc.*) must be recorded in the analysis logbook or analysis worksheets.

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Table 40
Table 40 Methylene Blue Active Substances - SM 5540C
Quality Control Requirements

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Table 40
Table 40 Methylene Blue Active Substances - SM 5540C
Quality Control Requirements

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Table 40
Table 40 Methylene Blue Active Substances - SM 5540C
Quality Control Requirements

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Table 41
Cyanide, Available - OIA Method 1677
Quality Control Requirements

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Table 41
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Quality Control Requirements

Quality Control Element	Frequency	Acceptance Criteria	Corrective Action
Calibration Standards and Blanks	One per batch of ≤ 20 samples per matrix per day Must undergo the same procedures as samples	Calibration standards must be used in the calibration curve. Blanks must be below the MDL or the lowest calibration standard.	Check calculations, standards, and preparation. Recalibrate and reanalyze samples.
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per batch of ≤ 20 samples per matrix per day Must undergo the same procedures as samples	RPD ≤ 20%	Check MS/MSD results and data. Note in the case narrative. Matrix interference is the most likely cause.
Laboratory Duplicate	One per batch of ≤ 20 samples per matrix per day Must undergo the same procedures as samples	20% RPD for results ≥ 5× RL. For results between 1× and 5× RL, the absolute difference between the sample and duplicate must be ≤ 1× RL.	Check data and report unacceptable precision in the case narrative.
Quality Control Samples	With the initial calibration and after every 10 samples	The initial calibration verification and continuing calibration verification must be within the laboratory's established control limits.	Determine the source of the error. Recalibrate and reanalyze samples since the last acceptable calibration verification.

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Table 41
Cyanide, Available - OIA Method 1677
Quality Control Requirements

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Table 41
Cyanide, Available - OIA Method 1677
Quality Control Requirements

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Table 42
Nitrate/Nitrite as Nitrogen - SM 4500NO₃ F & US EPA Method 353.2
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration Curve	Daily before sample analysis and after any corrective action	Correlation coefficient ≥ 0.995 over the calibration range unless otherwise specified in the method	Recalibrate. Check standards and reagents. Repeat initial calibration verification and continuing calibration verification.
Method Blank	One per batch of 20 samples or fewer	Must be < RL	Re-prep and re-analyze with batch. If persistent, investigate reagent contamination.
Laboratory Control Sample (LCS)	One per batch of 20 samples or fewer	Within 90-110% recovery	Re-prep and re-analyze with batch.
Matrix Spike (MS)	One per batch of 20 samples or fewer	Within 80-120% recovery	Flag data. Evaluate matrix effects.
Matrix Spike Duplicate (MSD)	One per batch of 20 samples or fewer	RPD ≤ 20%	Flag data. Evaluate precision.
Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the run	Within 90-110% of the true value	Recalibrate and re-analyze all samples since the last passing CCV.
Continuing Calibration Blank (CCB)	After every CCV	< RL	Re-analyze. If persistent, clean system.

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Table 42
Nitrate/Nitrite as Nitrogen - SM 4500NO$_3$ F & US EPA Method 353.2
Quality Control Requirements

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Table 42
Nitrate/Nitrite as Nitrogen - SM 4500NO$_3$ F & US EPA Method 353.2
Quality Control Requirements

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Table 42
Nitrate/Nitrite as Nitrogen - SM 4500NO$_3$ F & US EPA Method 353.2
Quality Control Requirements

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Table 43
Total Kjeldahl Nitrogen - SM 4500N C & US EPA Method 351.2
Quality Control Requirements

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Table 43
Total Kjeldahl Nitrogen - SM 4500N C & US EPA Method 351.2
Quality Control Requirements

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Table 43
Total Kjeldahl Nitrogen - SM 4500N C & US EPA Method 351.2
Quality Control Requirements

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Table 43
Total Kjeldahl Nitrogen - SM 4500N C & US EPA Method 351.2
Quality Control Requirements

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Table 44
Ammonia as Nitrogen - SM 4500NH$_3$ & US EPA Method 350.1
Quality Control Requirements

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Table 44
Ammonia as Nitrogen - SM 4500NH$_3$ & US EPA Method 350.1
Quality Control Requirements

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Table 44
Ammonia as Nitrogen - SM 4500NH$_3$ & US EPA Method 350.1
Quality Control Requirements

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Table 44
Ammonia as Nitrogen - SM 4500NH$_3$ & US EPA Method 350.1
Quality Control Requirements

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Table 45
Phosphorous, Total - SM 4500F & US EPA Methods 365.1 & 365.4
Quality Control Requirements

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Table 45
Phosphorous, Total - SM 4500F & US EPA Methods 365.1 & 365.4
Quality Control Requirements

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Table 45
Phosphorous, Total - SM 4500F & US EPA Methods 365.1 & 365.4
Quality Control Requirements

Quality Control Parameter	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike (MS) and Matrix Spike Duplicate (MSD)	One per batch of ≤ 20 samples per matrix per day Must undergo same analysis as parent project samples	See Acceptance Criteria Table ≤ 20% RPD Control limits must be used in place of the method control limits for project specific samples	See Acceptance Criteria Table for MS/MSD recovery and RPD limits. If parent sample concentration is 4 times the spiking concentration
Quality control sample issues	The laboratory must document the resolution for all issues	The laboratory must re-run the batch	Document the issue in the laboratory run log

Notes:

- Sample weights and volumes for MS and MSD must be recorded and the same weight or volume must be analyzed for the MS and duplicate.
- For matrix interference, the RPD should not be calculated with the sample and duplicate results if either is less than the RL.
- MS and MSD must be analyzed using the same laboratory test method and all associated steps and reagents for project samples.
- The MS and MSD should be performed on a sample that is expected to contain target analytes or a sample which has previously been shown to contain target analytes. If the parent sample is not specified, the laboratory must perform MS/MSD analysis on a sample of a similar matrix type from any project.
- For MS and MSD recoveries, if the concentration of the native sample is greater than 4 times the spiking concentration, then no control limits are applied.

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Quality Control Requirements

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Quality Control Requirements

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Sulfide by Titration - SM 4500S F & SW-846 Method 9034
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike (MS) and Matrix Spike Duplicate (MSD)	One MS and one MSD for each matrix being tested for each method being used, at least one per batch of ≤ 20 samples per matrix type. Must undergo the same preparation procedures	RPD within laboratory established limits	Analyze MS and MSD results in the case narrative. MS/MSD results are not applicable when sample concentration is 4 times the spike concentration
Laboratory Duplicate	One MS and one MSD for each matrix being tested for each method being used, at least one per batch of ≤ 20 samples per matrix type. Must undergo the same preparation procedures	RPD within laboratory established limits	Analyze data and report unacceptable precision in the case narrative
Quantitation Issues	The instrument calibration curve must extend to the reporting limit. Samples that require dilutions must be diluted and reanalyzed	The instrument calibration curve must extend to the reporting limit	Dilute the sample to bring the target analyte concentration within the calibration range

Notes:

- For MS analyses, acceptance criteria are not applicable for RLs that are elevated because the concentration of analyte in the sample is 4 times the spike concentration or greater than the calibration range.

- For laboratory duplicates, the RPD should not be calculated when the results for the sample and duplicate are less than the RL.

- When the MS and MSD must be analyzed at a dilution greater than the RL, the acceptance criteria are applicable only for samples analyzed at the RL. Analyses at dilutions greater than the RL are not required to meet acceptance criteria. Analytes that are not detected in the associated blank must be reported and flagged as estimated. Results for analytes that exceed the calibration range are reported from the dilution analysis.

- QC and MS must be analyzed using the same collection and preparation methods and analytical procedures applied to the samples.

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Quality Control Requirements

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- t nu rs ds pr p r d r n t r nts sp n s ut ns n t r t n nd n h st nd rds nd nsu s *e.g.,* t r p p r s r n s ntr u tu s *etc.* ust r rd d n th n ss s r n ss s r sh ts

- th MS R s uts d pt n r t r d t r th t n t n s p s ss t d th th sp s p nd d t r n d th s n t th d

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Table 47
Sulfide by Colorimeter – SM 4500 S D
Quality Control Requirements

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Table 47
Sulfide by Colorimeter – SM 4500 S D
Quality Control Requirements

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Table 47
Sulfide by Colorimeter – SM 4500 S D
Quality Control Requirements

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□□□□r□t□r□Dup□□□□t□	One per batch of ≤ 20 s□□ p□□s p□r □ □tr□□ p□r d□□□ Must und□r□□ □□□s□□ p□□ pr□p□r□t□□□ pr□□□dur□s□	20% RPD for results ≥ 5× th□ R□ □r □ d□□□r□n□□ □□□R□ □□r □□u□□us □nd □ □× th□ R□ □□r s□□d s□□ p□□s □h□n □t □□□st □n□ □□th□r□suits □s □ □× th□ R□□	□□□□ d□t□ □nd r□p□rt un□□□□pt□□□□ pr□□□s□□n □n th□ □□s□ □□rr□t□□□□
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Table 47
Sulfide by Colorimeter – SM 4500 S D
Quality Control Requirements

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Table 48
Biochemical Oxygen Demand - SM 5210B
Quality Control Requirements

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Table 48
Biochemical Oxygen Demand - SM 5210B
Quality Control Requirements

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Table 49
Chemical Oxygen Demand - SM 5220D & US EPA Method 410.4
Quality Control Requirements

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Quality Control Requirements

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Quality Control Requirements

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Table 49
Chemical Oxygen Demand - SM 5220D & US EPA Method 410.4
Quality Control Requirements

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Table 50
Chloride by Titration - SM 4500Cl E & SW-846 Method 9251
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration Verification	Each time the instrument is setup and when calibration verification criteria are not met.	Correlation coefficient for the calibration curve. ≥ 0.995 Reanalyze each calibration point that does not meet criteria. If the calibration curve does not meet criteria, the calibration standards and calibration standard should be prepared and the method Reanalyzed. Such items include calibration standards and calibration standard should be prepared and the method Reanalyzed.	Recalculate using a different calibration curve. Analyst error is corrected. Reanalyze samples.
Mid-Run Calibration Verification	Every 10 samples and at the end of the analytical run.	Must be ± 10% of the expected value.	Recalculate using a different calibration curve. Analyst error is corrected. Reanalyze samples.
Initial Calibration Blank	After calibration and before sample analysis.	Target analytes must be < the RL.	Reanalyze the blank. Reanalyze samples.

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Table 50
Chloride by Titration - SM 4500Cl E & SW-846 Method 9251
Quality Control Requirements

Quality Control	Frequency	Description	Corrective Action
Continuing Calibration Verification	At the beginning and end of each analytical batch, after every 10 samples and at the end of the analytical sequence	Reagent Preparation and Instrument Calibration	Recalculate results if error is found. Reanalyze samples bracketed by the CCV if the CCV is not within criteria. Flag data if the CCV is within criteria but the recovery is outside the laboratory limits.
Continuing Calibration Verification	Immediately after the ICV	Titrant Consistency	Recalculate results if error is found. Reanalyze samples bracketed by the CCV if the CCV is not within criteria. Flag data if the CCV is within criteria but the recovery is outside the laboratory limits.
Method Blank	One per batch of ≤ 20 samples or per day, whichever is more frequent. Must undergo the same preparation procedures	Titrant Consistency	Reanalyze samples bracketed by the CCV if the CCV is not within criteria. Flag data if the CCV is within criteria but the recovery is outside the laboratory limits.

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Table 50
Chloride by Titration - SM 4500Cl E & SW-846 Method 9251
Quality Control Requirements

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Table 50
Chloride by Titration - SM 4500Cl E & SW-846 Method 9251
Quality Control Requirements

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Table 50
Chloride by Titration - SM 4500Cl E & SW-846 Method 9251
Quality Control Requirements

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Table 51
Organic Halides - SW-846 Methods 9020 & 9023
Quality Control Requirements

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Table 51
Organic Halides - SW-846 Methods 9020 & 9023
Quality Control Requirements

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Table 51
Organic Halides - SW-846 Methods 9020 & 9023
Quality Control Requirements

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Table 51
Organic Halides - SW-846 Methods 9020 & 9023
Quality Control Requirements

Quality Control	Frequency	Description/Criteria	Corrective Action
Matrix Spike (MS)	For aqueous samples, one per batch or ≤ 20 samples per matrix per day For solid samples, one per batch or ≤ 10 samples per matrix per day Must undergo the same preparation and analysis	The percent recovery (%R) must be within laboratory-generated control limits	Assess QC as appropriate and document in data review and report narrative. MS/MSD results are reported for project specific samples in the batch
Quality Control Samples	With the instrument calibration	The instrument calibration must be verified to contain the compounds at the concentrations within the calibration range	Document the steps taken to bring the instrument back into the calibration range

Notes:

- Method blanks are analyzed to demonstrate that interferences from the analytical system or glassware are minimized and are not significant relative to the reporting limits.

- The laboratory must establish surrogate control limits based on statistical evaluation of recovery data. The limits must be evaluated periodically (at least annually) or when there is a change in reagent source, reagent lot number, or other conditions that may affect surrogate recoveries.

- The calibration standards must be prepared using the same type of solvent or reagent water that will be used to prepare the samples and must result in the same concentration of solvent in the calibration standards as will be present in the sample extracts.

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Table 51
Organic Halides - SW-846 Methods 9020 & 9023
Quality Control Requirements

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Table 52
Sulfate by Turbidimeter - ASTM D516 & SW-846 Method 9038
Quality Control Requirements

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Table 52
Sulfate by Turbidimeter - ASTM D516 & SW-846 Method 9038
Quality Control Requirements

Quality Control	Frequency	Acceptance Criteria	Corrective Action
Matrix Spike	One per batch ≤ 20 samples per matrix per method. Must undergo same preparation procedures	Analyte concentration must be ≥ 4× spike added	MS is accepted based on data and reported unless accepted errors in the process
Duplicate	One per batch of ≤ 20 samples per matrix per method. Must undergo same preparation procedures	20% RPD for results ≥ 5x the RL or difference ≤ RL.	Data and reported unaccepted processing in the process
Quality Control Issues	The instrument concentration must be verified and results must be diluted and reanalyzed	The instrument concentration must be within the calibration range	Dilute the sample to bring the result concentration within the calibration range

Notes:

- The lab standard used to develop an independent source for verification of the calibration curve. The lab standard used to develop the calibration curve. The lab standard used to develop the calibration curve. The lab standard used to develop

Table 52
Sulfate by Turbidimeter - ASTM D516 & SW-846 Method 9038
Quality Control Requirements

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Table 53
pH - SM 4500H B & SW-846 Methods 9040 & 9045
Quality Control Requirements

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Table 53
pH - SM 4500H B & SW-846 Methods 9040 & 9045
Quality Control Requirements

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Table 54
Specific Conductance - SM 2510B & SW-846 Method 9050
Quality Control Requirements

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Table 55
Paint Filter Test – US EPA SW-846 Method 9095
Quality Control Requirements

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Table 56
Turbidity – SM 2130B
Quality Control Requirements

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Table 56
Turbidity – SM 2130B
Quality Control Requirements

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Table 57
Alkalinity – SM 2320B
Quality Control Requirements

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Table 57
Alkalinity – SM 2320B
Quality Control Requirements

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Table 57
Alkalinity – SM 2320B
Quality Control Requirements

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Table 58
Oxidation-Reduction Potential - SM2580B
Quality Control Requirements

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Table 58
Oxidation-Reduction Potential - SM2580B
Quality Control Requirements

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Table 58
Oxidation-Reduction Potential - SM2580B
Quality Control Requirements

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Table 59
Chromium, Hexavalent by Colorimeter - SM 3500Cr B & SW-846 Method 7196
Quality Control Requirements

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Table 59
Chromium, Hexavalent by Colorimeter - SM 3500Cr B & SW-846 Method 7196
Quality Control Requirements

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Table 59
Chromium, Hexavalent by Colorimeter - SM 3500Cr B & SW-846 Method 7196
Quality Control Requirements

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Table 59
Chromium, Hexavalent by Colorimeter - SM 3500Cr B & SW-846 Method 7196
Quality Control Requirements

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Table 59
Chromium, Hexavalent by Colorimeter - SM 3500Cr B & SW-846 Method 7196
Quality Control Requirements

Quality Control Element	Requirement	Acceptance Criteria	Corrective Action
Laboratory Duplicate	Analyze 1 per batch or ≤ 20 samples per matrix per day Must be a client sample processed through all steps of the method Must not be performed on a blank or a sample at or below the RL	RPD ≤ 20% for aqueous when both results are ≥ 5× the RL or one result is < RL RPD ≤ 35% for solid when both results are ≥ 5× the RL or one result is < RL	Flag data and report the unacceptable precision in the QC section of the report
Matrix Interference	Analyze 1 per batch per matrix Must be a client sample processed through the entire analytical procedure Must undergo the same preparation and analysis as the parent sample	Interferences are suppressed if the recovery is within 85-115%	If suppression or enhancement is observed, dilute and reanalyze samples Add a matrix spike to the batch if sufficient sample is available. Spike at the same concentration as the parent sample.

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Table 59
Chromium, Hexavalent by Colorimeter - SM 3500Cr B & SW-846 Method 7196
Quality Control Requirements

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Table 59
Chromium, Hexavalent by Colorimeter - SM 3500Cr B & SW-846 Method 7196
Quality Control Requirements

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Table 59
Chromium, Hexavalent by Colorimeter - SM 3500Cr B & SW-846 Method 7196
Quality Control Requirements

In the case of a matrix that produces results for the MS/MSD that are outside the laboratory control limits, and/or produces poor precision (RPD), the case narrative must discuss the matrix interference.

- The concentration of the matrix spike and matrix duplicate samples must be at the level specified in the analytical method, or at the client requested concentration. If the RPD should not be calculated.

- Calibration verification must be performed as described in the associated analytical method.

- Blanks must be free of analytes at or above the reporting limit.

- Any sample dilution must bring the target analyte concentration within the calibrated range of the instrument.

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Table 60
Hardness by Titration - SM 2340C
Quality Control Requirements

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Table 60
Hardness by Titration - SM 2340C
Quality Control Requirements

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Table 61
Asbestos
Quality Control Requirements

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Table 61
Asbestos
Quality Control Requirements

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Table 62
Total Coliforms – SM 9223B
Quality Control Requirements

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Table 63
Moisture, Ash Content, and Organic Matter – ASTM D482, ASTM D2216, and ASTMD2974
Quality Control Requirements

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Quality Control Requirements

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Attachment L

Statistical Monitoring Plan for Ground Water Monitoring

Statistical Procedures for Ground Water Monitoring Program
Wayne Disposal, Inc

1.0 Introduction

The following statistical procedures are used to analyze the statistical significance of measured concentrations of ground water monitoring parameters at Wayne Disposal, Inc (WDI). This program was developed in accordance to meet the requirements of 40 CFR 264.97 and Rule 506 of the Administrative Rules for Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1995 PA 451, as amended.

2.0 Overview of Statistical Procedures

The statistical evaluation program for WDI is designed to signal statistically significant concentrations of monitoring parameters measured in samples collected quarterly or semi-annually from the wells in the monitoring well network. Different statistical techniques are used for different monitoring parameters depending on the nature of the data. The statistical comparisons are either intrawell (each well is compared to its own background) or based on the reporting limit, which is the standard laboratory reporting limit approved by EGLE for use in hazardous waste detection monitoring programs. When intrawell statistical comparisons are used, the statistical procedure is selected based on the degree that the background data are censored.

The monitoring parameters measured during each analysis are divided into four categories: primary parameters, secondary parameters, tertiary parameters, and field parameters (see Figure 1). The list of primary parameters is comprised of volatile organic compounds that are known to present within the waste. As these compounds do not generally occur in nature at measurable concentrations, a concentration above the reporting limit for any single parameter will result in an apparent statistically significant increase (SSI) per the Operating License. Apparent SSIs are confirmed or refuted by collecting four replicate samples. If the parameter is detected in two or more replicates it becomes a confirmed SSI per the Operating License.

The secondary monitoring parameters are mainly inorganic parameters that are found in elevated concentrations within the leachate. As these parameters are naturally occurring, their presence in ground water may or may not be an indication of a release and it is often necessary to determine the significance of changes in concentration relative to estimates of the true background concentrations. In this program secondary parameters are used to detect a possible release in the following ways. First, an SSI for any two (or more) secondary parameters in a sampling event in a single well will result in an apparent statistically significant increase (SSI). As with primary parameters, apparent SSIs are confirmed or refuted by collecting four replicate samples. This approach is designed to detect relatively subtle changes in ground water quality as evidenced by several parameters at once. In addition, a confirmed, order of magnitude increase (10 times the background concentration) in the concentration any single parameter will also result in a statistically

significant increase. This will ensure that a large increase in one secondary parameter is appropriately investigated.

The tertiary parameters are those parameters for which background had already been established prior to the current monitoring program. The tertiary parameters in this program will continue to be measured during detection monitoring but will not be subjected to the statistical analyses described below. The analytical results from the tertiary parameters will be used to evaluate potential non-release related ground water quality changes, such as might be caused by well corrosion and grout contamination. These parameters are not analyzed statistically because they are poor indicators of a release.

Field parameters are those parameters measured in the field during sample collection, mainly for the purpose of showing that ground water quality has stabilized during well purging. These parameters will not be analyzed statistically.

3.0 Description of Statistics for Detection Monitoring

The statistical tests to be used for all detection monitoring events are described in the following section. This section includes the definition and procedures for calculating "background", and the procedures for conducting the statistical analyses.

3.1 Parameters

The parameter list for the ground water monitoring program is presented on Attachment H of the SAP. The following descriptions of background calculation and statistical analyses are presented separately for the primary and secondary parameters, respectively.

3.2 Background

The background statistics for all monitoring parameters are to be calculated using the methods described below. The recalculation of the moving background for secondary parameters, as described below, will also follow these procedures. For new wells, or replacement wells that cannot utilize the data from the replaced well, an interim background as defined in Section 3.3 will be used for applicable secondary parameters until eight samples are collected. Then the background described below will apply.

Primary Parameters - The decision of whether there is a statistically significant increase in a primary parameter is essentially the decision of whether the parameter is present in the ground water at prescribed reporting limits. For all the primary parameters, the occurrence of the parameter above the laboratory's reporting limit is a statistically significant event and re-sampling must be initiated to confirm or refute the occurrence.

Secondary Parameters - Determination of the initial intrawell background statistics was completed utilizing the first eight sampling events beginning in 1988. However, beginning at the end of 1995, each time four new analyses were completed, the oldest four measurements were dropped from the database, the most recent four added, and the background statistics recomputed. This is repeated each year keeping about a six-year lag

between the background period and the detection monitoring samples. If the program moves to semi-annual monitoring (such as may be possible in post-closure), the background will be updated every year until the moving background reaches the point where years with semi-annual sampling are to be included. Then the background will be updated every two years (after four new samples have been collected) and thus the moving background window will continue to lag at least six years behind.

The nature of the background statistics and the method of calculation of these statistics for the secondary parameters is based on the degree of censorship of each parameter at each well. The secondary parameter list includes parameters which are highly censored (at least half of the values are below detection limits), those which are moderately censored (more than half the values are above detection) and those which are essentially all above reporting limits (the method detection limits are defined in the operating license). Some parameters exhibit varying degrees of censorship at different wells.

If the background data for a parameter contains at least five detectable background values, but contains some non-detects, the non-detects will be alternately assigned values of zero and the detection limit. If all the background values are above detection, the background statistics will be calculated from the background data "as is". The mean and standard deviations will be calculated using the standard statistical equations for these quantities and the data will be analyzed using control charts as described below. In no case will a standard deviation of less than 10 percent of the mean be used in a statistical test, as this is evidence of autocorrelation in the data. If the calculated background standard deviation is less than 10 percent of the mean, then 10 percent of the mean will be substituted for the background standard deviation.

If half or more of the intrawell background measurements are below reporting limits (four or more below detection limit values), then the background statistics will be calculated based on the proportion of values above reporting limits. This quantity will be used to conduct a test of proportions as described below.

The selection of the intrawell control chart and test of proportions statistical tests was made in part because these two tests are robust to the underlying data distribution. When using a moving background window consisting of eight samples, goodness-of-fit tests for normality are unreliable in many cases due to the high degree of autocorrelation in the data. This problem exists in the groundwater data at WDI as groundwater moves on the order of several feet per year resulting in a violation of the requirement for independent samples for determining data distribution characteristics. With the control chart and test of proportions approach, deviations from normality are generally not an issue. Outliers are usually readily visible in the background data. If a data point is questionable, Dixon’s Outlier test can be used, as it is applicable to small data sets.

3.3 Performance of Statistical Tests

The methods to be used for statistical analyses of all primary and secondary parameters that have a background, as defined in Section 3.2, are described below. For new wells, the primary parameters will be evaluated as described below but the secondary parameters will be evaluated using an interim background consisting of four samples taken at least one month apart. For replacement wells, a decision must be made as to whether the existing background from the well replaced is appropriate for the new well. If it is, such as might be expected when a damaged well is replaced by a well screened in the same stratum, then the existing background can be used with the statistical tests described below. If the replacement well cannot be placed in the same strata, or the old well is believed to have yielded unrepresentative results, then the replacement well is considered a new well for the purposes of statistical analyses and will be handled as described above.

Primary Parameters - For the primary parameters, any measured concentration of any parameter which is above the laboratory reporting limit will initiate quadruplicate re-sampling for confirmation of the affected parameter(s), in accordance with the operating license. If the statistical failure is repeated, then a statistically significant increase is confirmed. If the apparent increase is not confirmed, then normal detection monitoring will be resumed.

Secondary Parameters - The statistical analysis of secondary parameters will be conducted by one of two statistical tests, depending on the degree that the intrawell background data are censored. If more than half the data are above reporting limits, a control chart approach will be used. If at least half the background data are below reporting limits, a test of proportions will be used to analyze the data. There is also a default provision to investigate a dramatic increase in any single parameter regardless of the results of outcome of the statistics. If there are statistically significant increases for any two secondary parameters at any single well, and the increases represent less than a ten-fold increase over background, WDI shall undertake the procedures identified in the operating license, including re-sampling in quadruplicate. In this case, both failures must be verified by re-sampling to confirm the statistical increase. If any single secondary parameter exhibits a ten-fold increase over background, that occurrence must be verified by quadruplicate re-sampling. If the increase is confirmed, a statistically significant increase has occurred. The statistical evaluation of moderately censored or uncensored secondary parameters will be conducted using intrawell statistical comparisons via a control chart approach. The combined Shewhart-CUSUM control chart will be used to analyze the statistical significance of the measured concentrations of secondary parameters. This approach consists of two statistical tests designed to detect different types of evidence of a release. The Shewhart limit is designed to detect a sharp increase in the concentration of a monitoring parameter in a single sample. The CUSUM limit is designed to detect gradual increases in the concentration of a parameter over time. The two techniques will be used as separate statistical tests. That is, failure of either test alone (or both) will signal a statistically significant increase for a given parameter. Therefore, if one parameter fails the CUSUM test and another exceeds the Shewhart limit, then an apparent statistically significant increase will have occurred, and confirmation of both failures must be undertaken.

Confirmation of an apparent failure of one of the two tests must be confirmed by an additional failure of that particular test. The Shewhart control chart compares a detection monitoring concentration of a parameter to the intrawell background mean plus a selected number of standard deviations. The test is performed by calculating the standardized mean, Z, for the detection monitoring concentration. As individual samples are collected during each detection monitoring event, the standardized mean for each measured parameter is calculated by:

$$Z = (x_m - x_b)/s_b$$

where: x_b is the intrawell background mean
x_m is the measured concentration during detection monitoring
s_b is the standard deviation of the intrawell background

The value of Z is then simply compared to a selected value, U, which represents the number of standard deviations from the intrawell mean. The Shewhart limit (U), or upper control limit will be 4.5, as recommended in the Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance (USEPA, March 2009). The statistical test is performed by simply comparing the value of Z to the value of U. If Z is greater than U, it is concluded that a statistically significant increase has occurred.

The Shewhart control chart will be used in the following manner. If a secondary parameter(s) exceeds the Shewhart limit and at least two secondary parameters fail a statistical test at any given well during a given sampling event, the well would be re-sampled in quadruplicate for the offending parameters, and the mean(s) of the quadruplicate analyses would be used to confirm whether the Shewhart limit(s) is exceeded. If there is confirmation, it would be concluded that there has been a statistically significant increase. If the increase is not confirmed, any unconfirmed measurements would be dropped from the control chart and replaced with the means of the quadruplicates.

The CUSUM control chart is designed to detect a trend of increasing concentrations over time, regardless of whether the Shewhart limit is exceeded or not. In the CUSUM procedure, the cumulative sum of the values for Z - k are tabulated over time, each time a round of samples are analyzed. The value for Z is computed as described above, and k is a selected parameter. During each analysis after the background determination period, a value for Z - k is computed and added to the previous total. As long as the cumulative total of Z - k is a negative number the cumulative sum (S) remains zero. As positive values accumulate, the value for S is compared to a selected value, h. If S is greater than h, then a statistically significant event has occurred. The values used for k and h will be k = 1 and h = 5, respectively, as recommended (USEPA, March 2009).

The CUSUM limit will be utilized in conjunction to the Shewhart limit and proportions test as follows. If the CUSUM limit is exceeded and at least two or more secondary parameters have failed a statistical test at any given well during any given sampling period, quadruplicate re-sampling of the well in question will be initiated. The mean values of the quadruplicate sample will then be used to re-compute S. If S again exceeds h, then the increase is confirmed. If the increase is not confirmed then the mean values of the quadruplicate sampling replace the results of the anomalous (unconfirmed) values within the CUSUM statistic for future analyses. These non-confirmed exceedances must be removed from the CUSUM control chart because their inclusion may cause additional false positive results when subsequent sample results are added to the cumulative sum.

For parameters that contain at least half non-detectable concentrations in the intrawell background database, a statistical test to determine the significance of the proportion of detectable occurrences during detection monitoring will be used. The test of proportions, which is based on the binomial distribution, is statistical test suited to this purpose. This statistical procedure analyzes the significance of an increase in the rate of detectable occurrences over time.

To implement the test of proportions, the proportion of detectable occurrences during the 8 background samples will be compared to the rate of detectable occurrences in the most recent four detection monitoring samples. The statistic is computed by the equation:

$$Z^* = P_m - P_b/[\ p(1-p)(1/N_m + 1/N_b)]^{0.5}$$

Where: P_m = proportion of detectable concentrations in last four detection monitoring samples
P_b = proportion of detectable concentrations in the eight background samples
N_m = number of detection monitoring samples (4)
N_b = number of background samples (8)
p = weighted proportion defined as

$$p = (n_m + n_b)/(Nm + Nb)$$

Where: nm = number of detection monitoring samples above reporting limits
nb = number of background samples above reporting limits

The value of Z* is then simple compared to a critical value, Z_C, obtained from standard tables for the normal variant, Z, at the desired level of significance. The test will be conducted at the 0.05 level of significance, therefore Z_C is equal to 1.645. Any value of Z* greater than Z_C signals a statistical failure for that parameter.

Each time a new detection monitoring sample is collected, the result is added to the previous three samples for determining the proportion of detectable occurrences. Thus, both the background and detection monitoring proportions involve a moving window, with the background lagging at least six years behind the window of detection monitoring. If detection limits are lowered during the monitoring program, the proportion of detectable occurrences will be the proportion of results above the older background detection limit until the background is updated to include the new lower detection limits. For example, if the old detection limit was 20 and the new detection limit is 10, then only concentrations above 20 (even though a concentration of 11 or above is now "detectable") will be considered detectable until the moving background window is based on samples with a detection limit of 10.

WDI will use the proportions test as follows. If there is a statistically significant increase in any two secondary parameters at a particular monitoring well (i.e., two failures of the test of proportions or a combination of control chart and proportions test failures), then re-sampling in quadruplicate would be initiated to confirm the suspected increase. Confirmation would be completed if both failures are repeated.

Attachment B5.B1

Ambient Air Monitoring Sampling and Analysis Plan

MASTER CELL VI
WAYNE DISPOSAL, INC. SITE #2
MID 048 090 633

1. INTRODUCTION

In accordance with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Air Quality Division (AQD), Materials Management Division (MMD) Part 111, ambient air monitoring will be conducted as a requirement of the Hazardous Waste License. The ambient air monitoring plan is an attachment to the license and a stand-alone document.

1.1 Monitoring Network

Ambient air quality is monitored at seven (7) stations around the perimeter of the Wayne Disposal, Inc. (WDI) Belleville, Michigan landfill Site #2 property. The ambient air monitoring program described is used to characterize the air quality associated with both Michigan Disposal Waste Treatment Plant (MID 000724831) and Wayne Disposal, Inc. (MID 048090633) Site #2. All seven sites are monitored for the following constituents:

- Polychlorinated Biphenyls (PCBs) using a polyurethane foam (PUF) sampler,
- Metals using a high volume Total Suspended Particulate (TSP) sampler, and
- Volatile Organic Compounds (VOCs) using a sorbent tube sampler.

Site 9 (82983) is a colocated site that has pairs of each sampling device. The AQD and MMD approved the discontinuation of sampling for PM_{10} (particulate with a diameter of 10 microns and less).

The sampling for all parameters will be conducted in accordance with the methods specified by the United States Environmental Protection Agency (USEPA) in Title 40 of the Code of Federal Regulations (CFR) Parts 50, 53, 58 and the Toxic Organic Compendium Method, TO-17 for solid sorbent tubes. Sampling is conducted in accordance with USEPA's 1-in-12-day sampling schedule.

At each station in the network, particulate samples are collected using TSP high-volume samplers for subsequent analysis by an analytical laboratory to determine TSP and metals concentrations, specifically, lead (Pb), cadmium (Cd), and chromium (Cr) in micrograms per cubic meter ($\mu g/m^3$). TSP concentrations are determined in accordance with 40 CFR Part 50, Appendix B. Metal concentrations are determined using EPA Method 200.8 Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry which is the same method as outlined in 40 CFR Part 50, Appendix G. PCB samples are collected using high-volume PUF air samplers and are analyzed for total PCBs (as Aroclors) using EPA Method TO-4A, Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using High Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic-Mass Spectrometry in Selected Ion Monitoring Mode (GC-MS SIM). Sorbent tubes are utilized to measure VOC's which are analyzed by the analytical laboratory for 1,1,1-trichloroethane, benzene, carbon tetrachloride, chloroform, ethylbenzene, xylene, methylene chloride, tetrachloroethene, toluene, trichloroethene, , and 1,1-dichloroethane.

The locations of the monitoring stations are presented in Table 1-1. Figure 1.1 presents a Google Earth image showing monitoring station location.

Table 1-1 Republic Service's Belleville Michigan Monitoring Network Site Locations

Station	Site ID
Site 5	82981
Site 6	82975
Site 7	82977
Site 8	82982
Site 9 (colocated samplers)	82983
Site 10	82984
Site 11	82989

Figure 1.1 Map Showing Republic Service's Belleville Michigan Monitoring Network Site Locations



2. SAMPLING

The following sections present the sampling methods for PCB's, TSP and metals, and VOCs.

2.1 PCB Sampling

At each sampling location in the monitoring network, sampling for PCB's is conducted utilizing high volume PUF samplers. Samples collected from the PUF sampler are analyzed and reported as total PCBs (as Aroclors). Sampling and analysis for PCB compounds is performed in accordance with USEPA's Toxic Organic Compendium Method TO-4A: Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using High Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD)[1]. The PUF samplers are collected every 12 days in accordance with USEPA's 12-day sampling schedule. Samples are collected over a 24-hour period and then returned to the analytical for analysis.

PCB air samples are collected by pumping air through a sampler containing a quartz fiber filter and adsorbent trap (PUF sample) at a flow rate of approximately 8 standard cubic feet per minute (cfm) or 0.225 cubic meters per minute (m^3/min) to obtain a total sample volume of greater than 300 standard cubic meters (scm) over a 24-hour period to separate the particle bound and vapor phase fractions.

The holding times for PUF samples are crucial for maintaining the integrity of the analysis. The extraction should be done within 7 days of the sample collection, and the PUF media has a shelf life of 30 days from its certification date. PUF samples are stored after sample collection and shipped at <4°C to prevent degradation or loss of analyte. The PUF samples are shipped by the site technician to the analytical laboratory within 7 days of sample collection.

After sample collection, the PUF cartridges are extracted by the analytical laboratory to release the adsorbed compounds. These extracted compounds are then analyzed by GC/MD SIM to identify and quantify PCB concentrations. The analytical laboratory contracted to analyze these samples analyzes for Total PCBs (as Aroclors), and Aroclors 1242 and 1260, specifically. Results of the analysis are presented in micrograms (µg).

In accordance with the WDI Chemical Waste Landfill approval order, the analytical method must achieve a minimum method detection limit of two hundredths micrograms per cubic meter (0.02 ug/m^3) for PCBs (total) which is being achieved by the contract laboratory.
The reportable detection limit (RDL), which is the same as the practical quantitation limit (PQL), is determined by the lowest calibration for the sample. For Aroclors 1242 and 1260, the PQL is 2.50 µg. For total PCBs (as Aroclors), the PQL is 5.00 µg.

For the PCB samplers, single point checks are performed prior to and after each 24-hour test period using a calibrated orifice transfer standard. This calibration check verifies the operational flow before each 24-hour sampling event. The purpose of this check is to track the sampler's calibration stability.

2.2 Metals

Metal concentrations of lead (Pb), cadmium (d), and chromium (Cr) are determined from samples collected using high-volume Total Suspended Particulate (TSP) samplers and in accordance with 40 CFR Part 50, Appendix B, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere High-Volume and Appendix G, Reference Method for the Determination of Lead in Total Suspended Particulate Matter.

The TSP high-volume air sampler vacuum motor pulls ambient air into a covered housing and onto the 8″ x 10″ Whatman EPM 200 glass microfiber filters at a flow rate between 36-60 cubic feet per minute (cfm) during a 24-hour sampling period every 12 days in accordance with EPA's 1-in-12-day sampling schedule. TSP air particulate samplers do not use a particle separator which results in the collection of all ambient particulates. The glass fiber filters are weighed pre- and post-sample, and the weight is used to determine the total suspended particulate matter. A filter is weighed before and after use to determine the net (mass) gain. The total volume of air sampled, corrected to EPA standard conditions (25 °C, 760 mm Hg [101 kPa]), is determined from the measured flow rate and the sampling time. The concentration of total suspended particulate matter in the ambient air is computed as the mass of collected particles divided by the volume of air sampled, corrected to standard conditions, and is expressed in micrograms per standard cubic meter (µg/std m^3).

The analysis from the TSP filters for metals follows of the analysis methods discussed in 40 CFR Part 50, Appendix G. This method is for the analysis of Pb from TSP filters by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) using a heated ultrasonic bath with nitric acid (HNO_3) and hydrochloric acid (HCl) or a heated block (hot block) digester with HNO_3 for filter extraction.

The detection limit for the metals (cadmium, chromium, and lead) are presented in Table 2-1. The RDL or PQL for cadmium, chromium, and lead is 5.00 ug.

Table 2-1 Metals Detection Limits

Metal	Detection Limit (µg/m^3)
Cadmium	0.005
Chromium	0.009
Lead	0.025

2.3 VOC

The monitoring procedure for VOC sampling involves pulling a volume of air through sorbet packing to collect VOCs followed by a thermal desorption-capillary GC/MS analytical procedure using TO-17. VOC sampling is conducted following EPA's 1-in-12-day sampling schedule.

At each monitoring location, the sorbent tubes, which have been stored at a temperature of <4˚C prior to sampling, are removed from their storage and transportation container and are equilibrated to ambient temperature during the sampling period. The site technician, using clean gloves, removes the sample tubes from the container, takes off their caps, and attaches the sample tubes to the sampling lines with non-outgassing flexible tubing. The pump flow rate is set using a mass flow monitor. A constant flow sampling pump is operated at approximately 0.10 liters per minute (lpm). Once sampling is complete, the site technician removes the sorbent tube from the pump, recaps the sorbent tube, and places

the sorbet tube in the original container for shipment. Once sampling is complete, the sorbent tubes must again be kept at <4˚C during transport back to the lab. The sorbent tubes must be analyzed within the 30-day holding time window.

VOC samples are collected at a flow rate adequate to reach the required limits of detection which are presented in Table 2-1.

Table 2-2 Organic Compound Ambient Air Detection Limits

Compound	Detection Limit ($\mu g/m^3$)
Benzene	0.04
Carbon Tetrachloride	0.25
Chloroform	0.05
Ethylbenzene	1.0
Methylene Chloride	1.0
1,1-Dichloroethane	1.0
1,1,1-Trichloroethane	1.0
Tetrachloroethene	0.1
Trichloroethene	0.1
Toluene	1.0
Xylene (total)	1.0

2.4 Meteorological Data

Meteorological data are routinely collected by WDI from the Willow Run Airport tower which is located approximately 0.4 miles north of the landfill. Meteorological parameters measured using an Automated Surface Observing System (ASOS/AWOS) weather station operated by the Federal Aviation Administration (FAA), consist of hourly measurements of wind speed, wind direction, weather conditions, temperature, station pressure, relative humidity, and precipitation. Meteorological measurements are not made on-site at the landfill.

3. DATA REPORTING

In accordance with the WDI Hazardous Waste License, within 60 days after the end of the month in which data are collected, all ambient air monitoring data will be reported in an acceptable electronic format to the EGLE, AQD. WDI will keep copies of all ambient air data on-site for at least 3 years. A request can be made to the Chief of the WDHM to modify the monitoring plan if one year of sampling events show non-detectable levels of that parameter. The determination to alter the ambient air monitoring plan shall be made by staff from both the MMD and AQD. The final approval letter regarding any changes to the ambient air monitoring plan will be issued by the MMD.

The monthly data, by site, are provided to MMD and AQD in a in an electronic submittal which includes the following information:

- Analytical laboratory reports and associated Quality Assurance/Quality Control (QA/QC) information
- Sampler flow data
- Sample results
- Chain of custody documentation
- Sampling narrative, which can include a certification statement and signature, and any issues identified.
- An evaluation of the data including any supporting figures and tables

In addition, on a quarterly basis, WDI will submit a report within sixty (60) days following the end of each quarter as required by the WDI EPA permit. This report includes the following data for the quarter:

- a tabular summary of all PCB analytical results of air monitoring, and
- all PCB analytical data reports from the air monitoring.

The quarterly results are presented to EPA in a spreadsheet, by month. The following data elements are presented in each monthly spreadsheet:

- UL Sample No.
- Sample ID
- Analyte
- Analytical Data
- Unit
- Method
- Matrix
- Date/Time Sampled
- Airflow
- Concentration in Micrograms per Cubic Meter
- Minimum Detection Limit

4. QUALITY ASSURANCE/QUALITY CONTROL

A site technician visits the monitoring station weekly to check that monitoring equipment is operational and to conduct flow checks and calibrations, when necessary. Calibrations are performed using National Institute of Standards and Technology (NIST) traceable standards and reference standard certificates for the certified reference standards are kept on file by WDI.

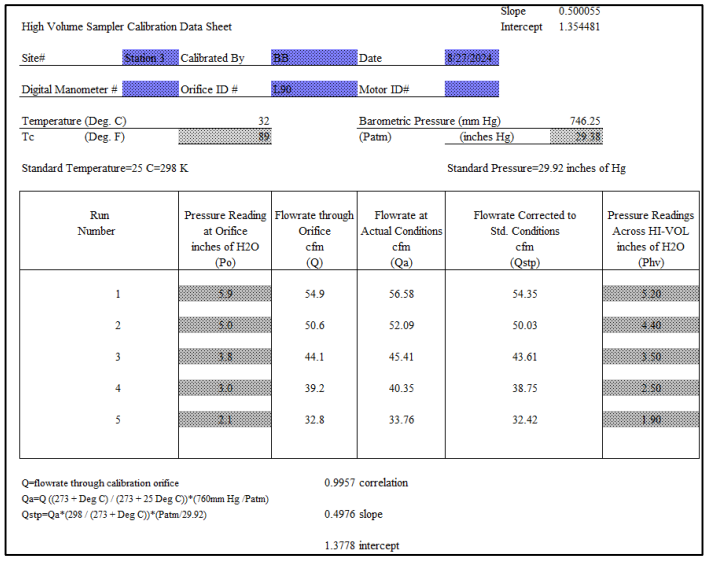
4.1 Sampling Equipment Calibration

Calibrations on air sampling equipment ensure accurate and reliable air sample collection, crucial for determining contaminant concentrations and assessing exposure levels. Brief descriptions of the calibration methods used for the PUF (PCB), TSP (metals), and VOC sampling equipment are presented below.

4.1.1 PUF Sampler

According to the manufacturer and EPA, PUF samplers used for PCB measurements should be calibrated at installation, after major repairs or maintenance, and at least annually. The PUF high volume sampler is calibrated using a calibrated orifice flow rate transfer standard without a foam plug. Generally, a five-hole resistance plate or a variable orifice is installed between the orifice and the filter adapter. Using manometers, adjust both manometers' midpoints by sliding their movable scales until the zero corresponds with the meniscus. Gently shake or tap any air bubbles remaining on the tubing connectors. The motor is turned on and the sampler is run for five minutes. The motor is then turned off and the site technician ensures that the manometers are set to zero. The motor is turned on again and the time, in minutes, that is required to pass a known volume of air (approximately 200 to 300 ft^3 of air for each resistance plate) through the roots meter by using the roots meter's digital volume dial and stopwatch is recorded. The manometer readings and roots meter manometer readings are recorded along with the ambient temperature and barometric pressure. The measured volumes are calculated on the calibration data sheets using equations in the PUF sampler operator manual.

Figure 4.1 Example PUF Sampler Calibration Data Sheet



High Volume Sampler Calibration Data Sheet

Slope 0.500055
Intercept 1.354481

Site# Station 3 Calibrated By BB Date 8/27/2024

Digital Manometer # Orifice ID # 1.90 Motor ID#

Temperature (Deg. C) 32
Tc (Deg. F) 89

Barometric Pressure (mm Hg) 746.25
(Patm) (inches Hg) 29.38

Standard Temperature=25 C=298 K

Standard Pressure=29.92 inches of Hg

Run Number	Pressure Reading at Orifice inches of H2O (Po)	Flowrate through Orifice cfm (Q)	Flowrate at Actual Conditions cfm (Qa)	Flowrate Corrected to Std. Conditions cfm (Qstp)	Pressure Readings Across HI-VOL inches of H2O (Phv)
1	5.9	54.9	56.58	54.35	5.20
2	5.0	50.6	52.09	50.03	4.40
3	3.8	44.1	45.41	43.61	3.50
4	3.0	39.2	40.35	38.75	2.50
5	2.1	32.8	33.76	32.42	1.90

Q=flowrate through calibration orifice
Qa=Q ((273 + Deg C) / (273 + 25 Deg C))*(760mm Hg /Patm)
Qstp=Qa*(298 / (273 + Deg C))*(Patm/29.92)

0.9957 correlation

0.4976 slope

1.3778 intercept

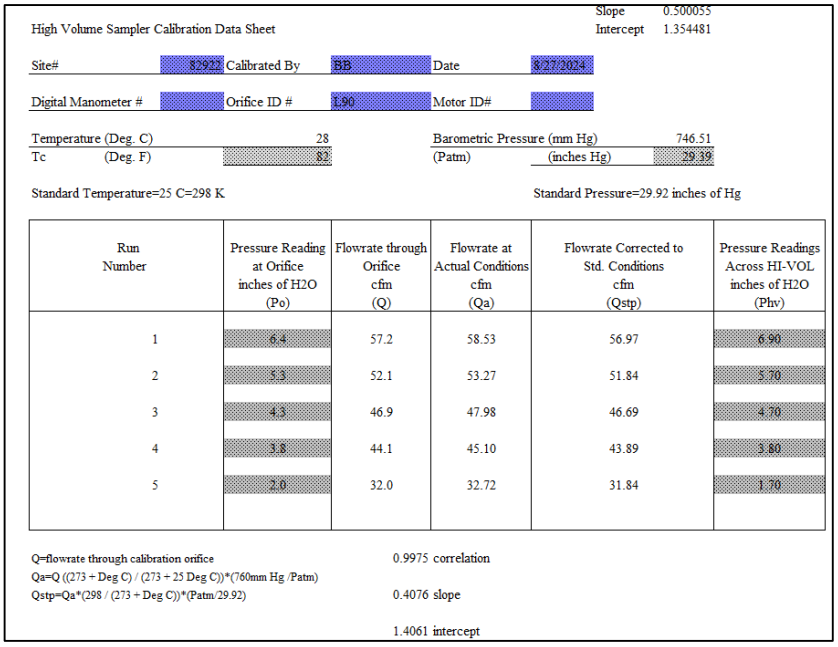
4.1.2 TSP (Metals) Sampler

For TSP and metals measurements, the manufacturer and EPA recommend that TSP samplers be calibrated upon installation, after any motor maintenance, and annually. The calibration is performed using resistance plates that vary air flow or a variable orifice calibrator which uses an adjustable or variable orifice.

The calibration is conducted by disconnecting the sampler motor from the mass flow controller and connecting the motor to a stable power source. A calibrator orifice and top loading adapter plate is mounted on the sampler with no filter installed. The motor is turned on and allowed to warm up to its normal operating temperature. Leak checks are conducted by covering the hole on top of the orifice and pressure tap on the orifice with your hands. If a high-pitched sound is heard, a leak is present and the top loading adapter hold-down nuts need to be tightened. A manometer is connected to one side of the pressure tap on the orifice with a rubber vacuum tube. The opposite side of the manometer is left open to the atmosphere. A resistance plant and gasket are inserted and the collar is tightened securely under the orifice and the manometer reading is recorded from the orifice and the continuous flow recorder reading (or manometer) from the sampler. This procedure is repeated five times using all resistance plates or, if using a variable orifice, five flow rates are achieved by adjusting the knob on the variable orifice to five different positions and taking five different readings.

The ambient air temperature, barometric pressure, sampler serial number, orifice serial number, orifice slope and intercept with date of last certification, today's date, site location, and operator's initials are recorded on the calibration field data sheet. The sampler motor pump is disconnected from the power source and the orifice and top loading adapter plate are removed. The sampler motor is reconnected to the electronic mass flow controller. The manometer readings are converted to standard air flows using the equations in the TSP operator manual. An example calibration data sheet is presented in Figure 4.1.

Figure 4.2 Example High Volume Sampler Calibration Sheet



High Volume Sampler Calibration Data Sheet

Slope 0.500055
Intercept 1.354481

Site# 82922 Calibrated By BB Date 8/27/2024

Digital Manometer # Orifice ID # 1.90 Motor ID#

Temperature (Deg. C) 28 Barometric Pressure (mm Hg) 746.51
Tc (Deg. F) 82 (Patm) (inches Hg) 29.39

Standard Temperature=25 C=298 K Standard Pressure=29.92 inches of Hg

Run Number	Pressure Reading at Orifice inches of H2O (Po)	Flowrate through Orifice cfm (Q)	Flowrate at Actual Conditions cfm (Qa)	Flowrate Corrected to Std. Conditions cfm (Qstp)	Pressure Readings Across HI-VOL inches of H2O (Phv)
1	6.4	57.2	58.53	56.97	6.90
2	5.3	52.1	53.27	51.84	5.70
3	4.3	46.9	47.98	46.69	4.70
4	3.8	44.1	45.10	43.89	3.80
5	2.0	32.0	32.72	31.84	1.70

Q=flowrate through calibration orifice
Qa=Q ((273 + Deg C) / (273 + 25 Deg C))*(760mm Hg /Patm)
Qstp=Qa*(298 / (273 + Deg C))*(Patm/29.92)

0.9975 correlation
0.4076 slope
1.4061 intercept

4.1.3 VOC Sampler

For VOC sampling, sampling pumps are calibrated according to manufacturer instructions. Pump flow rates are verified at the end of each sampling period to make sure a pump constant pump rate was maintained throughout the sample collection period. The flow rate measured at the end of sampling should agree within 10% with that measured at the start

of the sampling period for the sample to be considered valid and the average value should be used. An example calibration data sheet for the VOC pumps is presented in Figure 4.2.

Figure 4.3 Example VOC Calibration Verification Sheet

Date	8/15/2024	
Time	12:00 PM	
Site Location	Michigan 82989	
Rotometer Setting	0.26	mlpm
Calibrated by	BB	
Dry Gas Meter ID	Bios DC-Lite S/N 3950	
Calibration Run	Results	
1	0.1015	lpm
2	0.1014	lpm
3	0.1013	lpm
4	0.1015	lpm
5	0.1014	lpm
AVERAGE	0.1014	lpm
Standard Deviation	8.37E-05	
Target Flow Rate =	100	ml/min
	0.100	lpm
CF = Target/AVERAGE		
CF =	0.9860	

4.2 Sample Quality Assurance

On each run day, samples from the colocated site (Site 9) shall be analyzed and reported to the EGLE AQD for the assessment of sampler precision. To assess sampler precision, Republic will identify a primary sampler and review the colocated filter-based results on a quarterly basis per the requirements of 40 CFR Part 58 Appendix A Section 4.2.1. Republic will review sample results to evaluate whether filter-based sampling is meeting a 75% completeness objective on a quarterly basis. If the completeness objective is not met, Republic will analyze the issues that led to incomplete data and take corrective action.

On one sample day per month, one blank sorbent tube and metals filter shall accompany the samples to the colocated site, not have air pulled through it, then submitted to the laboratory as a “trip blank”.

If any parameter that is analyzed by the laboratory and determined to be non-detectable, the value of the method detection level is reported.

Attachment B5.C
Soil Sampling and Analysis Plan

MASTER CELL VI
WAYNE DISPOSAL, INC. SITE #2
MID 048 090 633

SOIL MONITORING
SAMPLING AND ANALYSIS PLAN
WAYNE DISPOSAL, INC. SITE #2
MID 048 090 633

1.0 INTRODUCTION

This Soil Monitoring Sampling and Analysis Plan (SM SAP) identifies the procedures for monitoring on-site soil and ditch sediment samples at Wayne Disposal, Inc. (WDI), Site 2 during the active life of the hazardous waste disposal facility. The soil monitoring program described in the SM SAP is designed to test on-site soil and ditch sediments for the presence of polychlorinated biphenyls ("PCBs"). PCBs detected in the soils or sediments could potentially be transported by storm water into the sedimentation basins at the site. The storm water in the sedimentation basins is treated for PCBs prior to discharge to Quirk Drain in accordance with a National Pollution Discharge Elimination System (NPDES) Permit. This monitoring program is one of the checks on the engineered controls and operational procedures employed by WDI to detect an on-site release of hazardous waste or hazardous waste constituents as early as possible and allow WDI to initiate efforts to locate and control the source and prevent an off-site release.

This SM SAP also prompts notification and response actions that WDI must take when an apparent or confirmed threshold level exceedance of PCBs in on-site soil/sediments occurs. This SM SAP does not apply to an off-site detection of PCBs in soil/sediments. In the event PCBs are detected and/or confirmed in off-site soil/sediments, WDI must notify the EGLE in accordance with the General Operating Conditions of the Operating License for Reporting Noncompliance that may endanger human health or the environment.

2.0 REVISIONS

WDI may revise this SM SAP and submit the revised plan to the Director of the Material Management Division, Michigan Department of Environmental Quality (MMD/EGLE) for review and approval prior to implementation.

3.0 AMPLE LOCATIONS

Figure 1 shows the locations of the 33 soil monitoring program sampling locations. Of the 33 locations 28 sampling locations are active and identified as SM-1 through SM-8, SM-9A, SM-10 through SM-20, SM-22 through SM-24 and SM-31 through SM-35. As described further below, sampling locations SM-30 and SM-26-29 are currently inactive. Locations that have been moved are designated with the letter of the alphabet that corresponds to the relocation number (e.g., SM-9A is the first replacement). SM-9 was replaced by SM-9A and SM-25A as part of these same construction activities. SM-21 was abandoned due to construction of eastern portion of MC VI-G1. SM-25A was abandoned due to construction of MC VI-F subcells. SM-9A, SM-10 through SM-15, and SM-22, will be reevaluated for replacement (if no other locations can be used to monitor the active area) or abandonment when cell construction proceeds in those areas.

SM-30 will be activated after Cell VI-G Phase 3 becomes active. As cells are closed, four additional soil sampling locations (SM-26 through SM-29) will be added after the final cover is installed.

The locations for the SM SAP samples are surveyed and are marked in the field with a monument. The following provides a breakdown of the soil monitoring points:

- Soil Monitoring Points:
  - SM-2 through SM-4, SM-6 through SM-8, SM-9A, SM-11, SM-13 through SM-16, SM-18 through SM-20, M-22 through SM-24, SM-34 and SM-35.
- 6 Sediment Monitoring Points:
  - SM-1, SM-5, SM-10, SM-12, SM-17, SM-31 through SM-33
- 4 Post Closure Soil Monitoring Points:
  - SM-26 through SM-29
- 1 Post MC VI F/G Construction Sediment Monitoring Point:
  - SM-30

One grab sample of soil will be collected from within 10 feet of the surveyed monument from each of the respective soil monitoring locations. One sediment sample will be collected from within the ditch at each of the respective drainage ditch locations within 10 feet of the surveyed monument in a linear fashion. At the time of sampling, the exact location for each of the individual samples will be marked with a flag and a written description of the location (distance from monument and compass direction) will be recorded on the sample collection log so that a confirmation sample can be collected if necessary (see Section 5 below). Upon initiation of WDI's next routine sampling event, the flag will be moved to the new sampling location following the procedures described in this section of the SM SAP.

4.0 SAMPLE FREQUENCY

The SM SAP samples are to be collected semiannually in spring and fall of each calendar year.

5.0 SAMPLE COLLECTION

Samples from each of the active monitoring locations shown on Figure 1 are to be collected using a disposable hand trowel or other tool capable of excavating a short distance into the soil/sediment. Each individual sampling location is to be prepared by laying out an area approximately one-half foot square on the soil/sediment surface and carefully removing vegetation, sticks, rocks, or other debris to expose a clear sampling surface. At each individual sampling location, one sample is to be collected by removing the top inch of soil/sediment from the one-half foot square area, placing the soil/sediment into a separate stainless-steel bowl, disposable foil pan, or Ziplock bag, gently mixing the soil/sediment in the selected type of container to homogenize the sample, and removing the homogenized soil/sediment from the container into clean glass sampling jars. A sample from each of the active sampling locations is to be submitted to the laboratory for PCB analysis.

Clean protective gloves must be worn during sample collection and must be replaced at each sample location. Care should be always taken when handling the samples. Each sample jar must be labeled with the sampling location, the time and date of the event, and the sampler's initials. If it is necessary to use non-disposable sampling equipment, the equipment will be decontaminated between sampling locations. In addition, one blind duplicate and one equipment blank for each piece of non-dedicated (if used) sampling equipment utilized in the sampling process (i.e., sample collection tools and homogenizing container) must be collected for each

sampling event. The equipment blank must be collected by pouring clean de-ionized water over and/or into the decontaminated piece of equipment and collecting the rinseate in the appropriate jar for analysis**.** After collection, the samples must be stored in a clean cooler containing ice or ice packs. The coolers containing samples must be stored in a secure location, until being transported to the laboratory.

A sample collection log (Figure 2) must be filled out at each sampling location and any unusual conditions encountered must be noted. A chain of custody (COC) form must also be filled out for each sampling event. This COC must be filled out fully for each sample submitted for analysis and each person responsible for the handling of these samples must sign and date the form. When the samples are delivered to the laboratory and the lab has signed for their receipt, a copy of the COC must be retained on site in the Quality, Environment, Health and Safety (QEHS) Department records.

6.0 SAMPLE ANALYSIS

The samples from each of the active sampling locations will be analyzed for total PCBs where total PCBs equals the sum of the following PCB aroclors: PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254 and PCB-1260. The analytical method detection limit will be 0.1 milligrams per kilogram (mg/kg) on a dry weight basis. Samples will be analyzed in accordance with USEPA SW-846 Method 8082. Samples will be analyzed within 40 days of collection to meet holding time requirements for the analytical method.

The laboratory quality control/quality assurance manual (QA/QC Manual) describing the required internal policies, guidelines, and procedures of any WDI contract lab is contained in the Groundwater Sampling and Analysis Plan (GW SAP). WDI is to use this QA/QC Manual in evaluating the QA/QC standard operating procedures of any contract laboratory utilized for the purposes of this SM SAP and ensure that the laboratory employs generally acceptable practices that meet the specifications of the QA/QC Manual in the GW SAP.

7.0 DATA EVALUATION

The analytical data must be evaluated to determine whether there has been an apparent threshold level exceedance (ATLE). The applicable threshold level is defined as follows:

- Total PCBs (as defined in Section 6.0 of this SM SAP) at or above 0.75 mg/kg.

8.0 RESPONSE ACTIONS

In the event of an ATLE, WDI must verbally notify the MMD/EGLE, Hazardous Waste Program Section staff immediately in accordance with the Environmental Monitoring Conditions of the Operating License and implement the procedures identified below to confirm the ATLE.

- Within 7 days of the ATLE, WDI must collect a verification sample at each soil sampling location for which an ATLE was reported. Each verification sample must be collected along the sides and bottom of the hole left by the prior sample. WDI must notify the MMD/EGLE prior to conducting verification sampling so that the MMD/EGLE can, if it chooses, split samples with WDI.

If the ATLE is not confirmed by the additional sample analysis, WDI is to resume routine monitoring. If the ATLE is repeated upon analyzing the second sample, a confirmed threshold level exceedance (CTLE) has occurred. In the event of a CTLE, WDI must notify the EGLE in

accordance with the Environmental Monitoring Conditions of the Operating License. Further, in the event of any CTLE, within 14 days of the CTLE, WDI is to collect the first phase of delineation samples to determine the extent of the areas exceeding the CTLE. Samples are to be collected and analyzed in accordance with the requirements in Sections 5.0 and 6.0. WDI must notify the MMD/EGLE prior to conducting delineation sampling so that the MMD/EGLE can, if it chooses, split samples with WDI.

Different approaches for locating delineation samples are required to be implemented depending on whether the CTLE has occurred:

- On top of closed landfills or other open areas.
- Along linear features such as drainage ditches or interior roads.

The approach for locating delineation samples for each of these scenarios is defined below. Before immediately and automatically implementing the defined delineation approach provided below, a visual evaluation of the area is to be completed to determine if there are features in the area that suggest a preferential pattern for the PCB exceedance (e.g., visible dust patterns, erosion gullies, vegetative cover, or lack thereof, low areas, etc). If it is determined that a preferential deposition pattern is present, WDI must collect samples from those locations as appropriate. Dependent on the type and size of the feature, samples from preferential area(s) may be included as extra samples or as part of the grid sampling procedure discussed below if their locations allow. If the visual check shows no features suggesting that the PCB exceedance may be preferentially located, the following procedure is to be used to locate delineation samples.

For a CTLE on top of closed landfills or other open areas, a grid sampling strategy is to be employed as follows:

- A 100 by 100-foot grid, divided into 25 by 25-foot grid intervals, is to be centered over the CTLE location and sixteen soil samples are to be collected from the center of each 25 by 25-foot grid interval. Of the sixteen soil samples, the four step-out soil samples immediately adjacent to the CTLE location and the four corner soil samples from the 100 by 100-foot grid are to be analyzed for PCBs. The laboratory is to hold the remaining eight soil samples pending the results from the initial eight soil samples. Close communication with the laboratory will be required to ensure that initial samples are analyzed quickly so that analysis of the additional samples for delineation, if necessary, can be completed without violating the holding time requirements of the PCB analytical method. WDI may voluntarily perform additional sampling within the bounds defined by the above procedure to refine the delineated boundary of the area exceeding the threshold limit defined in Section 7.0.
- If none of the eight initially analyzed soil samples contain PCBs above the threshold level defined in Section 7.0, the horizontal extent of the exceedance is considered to be the area inside the square drawn by connecting the four sample points immediately adjacent to the CTLE location.
- If any of the eight initially analyzed samples contain PCBs above the threshold level defined in Section 7.0, WDI is to do the following:
    - Contact the laboratory and request them to conduct PCB analysis on the soil samples that were collected and held for all locations that are contiguous to the PCB exceedance.

- Within 14 days following WDI's determination that a PCB exceedance in a response soil sample has occurred, submit a work plan, based upon a grid or transect approach, to the MMD/EGLE for review and approval to identify the extent of the PCB contaminated area along with a schedule for completing the work.

For a CTLE along a linear feature, sampling is to occur as follows:

- For a CTLE in a drainage ditch, three samples are to be collected, one upstream and two downstream, at approximately 25 feet intervals, on each side of the CTLE (taking care to pick locations of sediment accumulation areas), assuming the linear feature extends the required length in each direction. If the linear feature does not extend the required length in either direction, sampling will occur at the largest possible interval before the end of the linear feature is encountered.
- For a CTLE along a roadway, two soil samples are to be collected by stepping out approximately 25 feet in both directions parallel to the roadway and two samples are to be collected from directly across the roadway if samples from the opposite side of the roadway area were not collected and analyzed as part of the original sampling.
- If none of the samples are above the threshold levels defined in Section 7.0, the extent of soil/sediments expected to exceed the remediation threshold of 1 ppm will be bounded by a 50-foot long area centered on the CTLE sampling location.
- If any of the samples are above the threshold levels defined in Section 7.0, WDI is to continue using the same approach, stepping out at 25-foot intervals (or the largest possible distance, whichever is less) in the direction of the linear feature to collect additional samples. This sample pattern is to be repeated until the first location is found that is below the applicable threshold level in Section 7.0 or until the linear feature terminates.

After the delineation phase has been completed by obtaining the delineation phase sampling results identifying the area of soil/sediments with CTLE(s), the analytical data will be evaluated and WDI is to submit a plan to remove soils/sediments and to determine the source(s) or expected source(s) of the PCBs to the MMD/EGLE for review and approval. The plan is to be submitted to the MMD/EGLE within 14 days of completing the delineation phase. WDI shall remove at least the top six inches of soil/sediments (WDI may voluntarily remove more) of all soils at or above 1.0 mg/kg and perform verification sampling to confirm that the underlying soils/sediments are below the applicable threshold limit identified in Section 7, and the placement of clean soils to replace the excavated soils. The plan submitted to MMD/EGLE need only include a schedule to complete the excavation, fill and verification sampling described above; a drawing that shows the delineation sampling results, the limits of the soil to be removed, and the approximate locations of the verification samples; the source of the clean fill material, except if WDI will deviate from the removing 6 inches of soil in response to the CTLE, in such case WDI shall propose the corrective measure/remedy; and the steps to be taken to identify and control the source(s) of the PCBs. The verification sample locations are to be selected in accordance with the EGLE Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria.

9.0 REPORTING REQUIREMENTS

For semi-annual reports, the final data must be received from the laboratory, evaluated, and transmitted to the MMD/EGLE within 60 days of sampling. The report is to include a narrative of the sampling event, a map showing the locations sampled, copies of the sampling logs, a tabular summary and discussion of the data, a discussion of field and laboratory QA/QC, a description of any ATLEs or CTLEs, any resampling conducted, and any additional actions taken and/or proposed because of the report findings.

If a CTLE occurs, the data associated with the delineation phase, collected in accordance with Section 8.0, is to be received from the laboratory, evaluated, and transmitted to the MMD/EGLE within 45 days of the final sampling. The report is to include a narrative of the delineation sampling, copies of the sampling logs, a summary and discussion of the data, a drawing showing the delineation boundary, a schedule to perform soil removal (or an alternate plan, with schedule, in the event WDI proposes a remedy other than soil removal) and the steps to be taken to identify and control the source(s) of the PCBs.

Verification sampling data, collected to confirm that all soil/sediments exceeding the applicable threshold level has been removed in accordance with Section 8.0 is to be received from the laboratory, evaluated, and transmitted to the MMD/EGLE within 45 days following completion of the final round of verification sampling. The report is to include a narrative of the verification sampling, locations of all verification samples, copies of the sampling logs, a summary and discussion of the data, a drawing showing the limits of the excavation and the locations of the verification samples.

An annual summary report of the monitoring results must be submitted to MMD/EGLE by March 1 of the following year. At a minimum, the annual report must contain a map showing all locations sampled, a tabular summary and discussion of the analytical data collected during the previous year, a description of any threshold limit exceedances (i.e., ATLE and/or CTLE), any delineation and source investigation sampling conducted because of a CTLE, and any response actions performed to eliminate the source. Additionally, WDI must evaluate the sampling locations to determine whether the existing sample locations are adequate to effectively detect potential releases and prompt timely response activities.

10.0 RECORD KEEPING REQUIREMENTS

All analytical data and annual monitoring reports generated under this SM SAP must be stored on site within the QEHS filing system and be available to EGLE staff for inspection.

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SM-9A
SM-13
SM-34
SM-10
SM-11
SM-4
SM-12
SM-14
SM-22
SM-1
SM-15
SM-23
SM-24
SM-20
SM-30

(NORTH SEDIMENTATION BASIN)
(NORTH SEDIMENTATION BASIN)
SOUTH SEDIMENTATION BASIN EXPANSION
WWTP
SOUTH SEDIMENTATION BASIN
LINED POND

NOTES:
1. AERIAL TOPGRAPHY BY DRONEVIEW TECHNOLOGIES
   DATE OF AERIAL: FEBRUARY 03, 2025
   UPDATED WITH FLYOVER FROM MARCH 31, 2025.

SCALE 0' 100' 200' 400'

SS-9 SURFACE WATER SAMPLING LOCATION
SM-4 SOIL SAMPLING LOCATION - AREA A
SM-32 SEDIMENT SAMPLING LOCATION - AREA A
SM-20 SOIL SAMPLING LOCATION - AREA B
SM-17 SEDIMENT SAMPLING LOCATION - AREA B
SM 26 SOIL SAMPLING LOCATION - POST CLOSURE
SM 30 SEDIMENT SAMPLING LOCATION - POST MC VI F/G CONSTRUCTION
SS-12 SURFACE WATER SAMPLING LOCATION - POST MC VI F/G CONSTRUCTION

LEGEND:
NEW CELL BOUNDARY LOCATION
OLD CELL BOUNDARY LOCATION
PROPERTY LINE LOCATION
EXISTING CONTOUR (2 FT INTERVAL)
EXISTING STRUCTURE / BUILDING
EXISTING ROAD (PAVED / GRAVEL)
GRID COORDINATES
AREA A
AREA B

DATE:	04-14-25
DESIGNED BY:	RB
DRAWN BY:	BDA
CHECKED BY:	RB
APPROVED BY:	XZ

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REVISIONS			
REV	DATE	DRN	APP

WAYNE DISPOSAL SITE NO. 2
WAYNE, MICHIGAN

SOIL SAMPLING SURVEYED LOCATION MAP

PROJECT NUMBER 23L023
SCALE 1" = 200'
DRAWING NO 1

TIME PLOTTED: 1:34:05 PM
DATE PLOTTED: 11/4/2025
FILENAME: C:\Shared\Bax\Commercial\US Ecology\WDI\CAD\Site Monitoring Plans\2025 MONITORING PLANS\2025 SOIL SAMPLING SURVEYED LOCATION MAP.dgn

DRAWING SIZE: 24" X 36"

Attachment B5.D
LEAK DETECTION, COLLECTION AND REMOVAL SYSTEMS SAMPLING & ANALYSIS PLAN

MASTER CELL VI
WAYNE DISPOSAL, INC. SITE #2
MID 048 090 633

1.0 INTRODUCTION

The following sampling and analysis plan outlines the standard procedures for measuring flow volumes and for the collection and analysis of samples of the liquids collected from the leak detection, collection and removal system (LDCRS) in Master Cell VI. A LDCRS is a secondary leachate collection system located beneath the primary liner and on top of the secondary liner and is composed of geonet and geofabric that allows drainage to a sump. There is a riser pipe from the sump that allows liquids to be pumped out of the sump and sampled at the surface. There are currently thirteen LDCRS sumps within Master Cell VI: VI-A South, VI-A North, VI-B, VI-C and VI-D, VI-E-SE, VI-E-SW, VI-E-NW, VI-ENE, VI-G1, VI-F1, VI-F2, and VI-F3 The locations of these sumps are shown on Attachment A. Additional LDCRS sumps will be located in subsequent phases of Master Cells, VI-F and VI -G; however, these will not be operational until these cells are constructed and begin to receive waste.

This document has been prepared to direct the efforts of monitoring personnel in the collection of samples and volume measurements to meet the requirements of the Operating License issued under Part 111 of Michigan Act 451 for the facility and to ensure sound practices for the collection of these data.

This plan must be revised if there are any changes to the equipment or procedures contained herein. All proposed changes must be submitted to the Materials Management Division (MMD) of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for review and approval prior to implementation.

2.0 PUMPING/SAMPLING EQUIPMENT

Each LDCRS sump must be equipped with a submersible pump with a controller package and totalizing flow meter. The selected pumps were selected for the following attributes:
1) composed of stainless steel and Teflon and thus have low potential to impact the quality of environmental samples, 2) designed to collect groundwater samples with minimal aeration or perturbation of the sample and, 3) pumping rates are adjustable with high rates for removing liquids from the sump and low rates for sampling. Any pump system installed in the LDCRS should have similar attributes for pumping and for collecting samples, although Teflon should be avoided if possible in case there is a need for PFAS analyses at some point.

The reinforcement of the LDCRS in Master Cell VI subcell A-North completed in August, 2006 required the installation of a Black Hawk Model 101 pump system. This system was selected for its ability to draw water from a suction tube that extends through the 1-inch diameter slipline.

The discharge tube for the LDCRS pumps is composed of HDPE. At the surface, this tube is connected to a stainless steel or PVC discharge tube with the flow meter in line. The opening at the top of each LDCRS riser must be tightly covered with a cap in which the discharge tube and electrical cable penetrate through sealed ports. The discharge tube and electrical cable must be configured such that it does not come into contact with the ground surface and such that the end valve is protected. Any changes to the configuration of the LDCRS riser pipe as the waste surface ascends must ensure that the sampling tube is not susceptible to contamination.

3.0 INSPECTION AND VOLUME AND FIELD MEASUREMENTS

Each LDCRS must be inspected on a weekly basis to ensure that there is no evidence of damage or tampering that could allow waste or waste constituents to have entered the system. This includes potential vapor sources that could introduce contamination into the LDCRS, such as the leachate collection system. Any relevant observations must be recorded and include evidence of malfunctioning equipment or other potential problems described in detail. The weekly /after-storm inspection form in the Inspection Plan is used for documenting these inspections. The form must be fully completed with evidence of malfunctioning equipment or other potential problems described in detail.

Except as described below, once per week each LDCRS is pumped to dryness and the meter readings from the flow meters are recorded on Attachment B. The exception is for any LDCRS that yields less than 1 gallon-per-acre-per-day (gpad) during monthly pumping to dryness. The purpose of the exception is to retain sufficient volume in the system for monthly and quarterly sampling. The volume data must be evaluated each month to determine the average flow rate for the month produced on a gallons-per-acre-per-day basis.

Once per month, a sample of the water from each LDCRS sump must be field tested for pH and specific conductivity and these values must be recorded on Attachment B. The monthly volume data and field parameter data must be evaluated by the Environmental Manager, or their designee, at the end of each month, to determine if there are anomalous flow rates or field test results.

4.0 COLLECTION OF SAMPLES

Unless there is an insufficient amount of liquid generated by a LDCRS during a month's time (time between monthly purging/volume recording events), samples must be collected for laboratory analysis. In addition, any sump which yields volumes above the maximum expected volume (see Section 7.1) during a monthly purging/volume recording event must be sampled and analyzed for the quarterly parameter list. Further, any time a monthly field specific conductivity value exceeds the maximum expected value (see Section 7.1) a sample must be collected and analyzed for quarterly parameters, unless the conductivity measurement was made during the collection of the quarterly sample for that sump.

Prior to collecting the samples, the sump should be pumped until a minimum of 20 gallons are removed in order to ensure that the lines have been flushed (this is approximately 3 tubing volumes) unless the historical production rate of the sump indicates that less than 20 gallons will be available. Prior to sampling, the flow rate of the pump must be throttled back to the minimum deliverable flow rate and then the samples are collected. Following sample collection, the sump then must be pumped until dry.

Samples are collected within a nitrogen glove box whenever possible, unless access to a sump is not possible. Prior to sampling, the glove box is purged with nitrogen for approximately 20 minutes. The sample containers are placed within the box during purging. The glove box is

connected to the LDCRS pumps with a fitting that allows new Tygon^{TM} tubing to be used for each sample. At the time of sampling, the flow from the LDCRS is diverted into the glove box by turning the valve on the back of the box. All containers are then filled within the box while under positive pressure from the nitrogen. All containers are closed before opening the glove box to remove them.

During the sample event, specific conductance and pH of the liquid must be measured on a sample of the liquid. The volume purge data and pH/conductance data for each sump must be recorded on the Attachment B.

Samples for VOCs are collected first while ensuring that no headspace is present within the sampling vials. Next, the bottles for total organic carbon, total phenolics and dissolved metals are filled, in that order. Finally, the remaining miscellaneous sample analytes (e.g. sulfate, chloride, etc.) are collected. All samples are to be collected in the appropriate containers with the appropriate preservatives as outlined on Attachment C, "Handling Requirements of Monitoring Parameters." Care must be taken to ensure that preservatives are not spilled during sampling. Samples for dissolved metals may be field filtered with an in-line 0.45 micron filter cartridge and acidified to pH < 2 with HNO3, or, may be filtered and preserved at the laboratory upon delivery. Field filtering is preferred due to chemical changes that can occur during air-water interactions between sample collection and sample preservation at the laboratory.

A trip blank and a field blank for VOC analyses must be maintained and submitted for analysis for each 10 samples collected and/or for each day samples are collected. In addition, one blind duplicate sample must be submitted for complete analyses for every sampling event. Each sample container must be carefully labeled with the sampling location, time and date, identity of preservatives contained within, and the sampler's initials. After collection, the samples shall be stored in a clean cooler containing ice or ice packs. The coolers containing samples must be stored in a secure location until transport to the laboratory.

5.0 ANALYTICAL PROCEDURES

Each sample is to be analyzed for the parameters listed on Attachment D, "Methods and Reporting Limits for Organic and Inorganic Parameters." The analytical methods and targeted reporting limits must be those specified in Policy and Procedures Document WMRPD-111/115-8 unless EGLE approves alternate detection limits. If a revised WMRPD-111/115-8 is published by EGLE, Attachment E must be modified (as necessary) to be consistent with the revisions. Laboratory quality control frequencies and precision/accuracy requirements are provided in the quality assurance manual for the current contract laboratory.

6.0 RECORD KEEPING

In addition to the inspection/volume measurement forms contained in Attachment B, there are two other items required to ensure adequate record keeping for the LDCRS monitoring program. First, a field notebook must be maintained during sampling which includes, at a minimum, the identity of sampling personnel, the dates and time when samples are collected, a description of the sampling event, volume purged prior to sampling and any pertinent

observations of sample characteristics or sampling environment. Second, an equipment inventory, repair and maintenance log must be maintained. This log shall contain the serial numbers of all sampling equipment and a record of any repairs, maintenance, calibration or replacement of this equipment. Lastly, a chain of custody (COC) form must be filled out for each sampling event. A example copy of a COC is included as Attachment E. This form must be filled out fully for each sample submitted for analysis and each person responsible for the handling of the samples must sign and date the form. When the samples are delivered to the laboratory and the lab has signed for their receipt, a copy of this form must be retained. All recordkeeping information must be maintained onsite as part of the operating record.

7.0 DATA ANALYSIS AND REPORTING

Data analysis and reporting are required for both the volume data and the analytical data. Both volume and analytical data are evaluated statistically to determine if there has been a significant change.

7.1 Volume Rate Analysis

Volume data must be evaluated monthly to determine an average daily flow rate in gallons-per-acre-per-day (gpad). The average daily flow rate is calculated utilizing the following formula:

Flow Rate (gpad) = (Total Volume (gal)/Time (days))/Area of LDCRS (acres)

Areas, in acres, for the thirteen LDCRS are as follows: VI-AS (7.65), VI-AN (5.83), VI-B (6.13), VI-C (4.87), VI-D (7.24), VI-ESE (9.3), VI-ESW (5.7), VI-ENW (8.2), VI-ENE (11.6), VI-G Phase 1 (29.1), VI-F1 (3.8), VI-F2 (5.56), and VI-F3 (5.9). Areas, in acres, for the future LDCRS for future phases of Cells VI-F and VI-G will be calculated based on as-built drawings.

Experience with LDCRS volume rate data suggest the following behaviors are expected: 1) volume rates generally decrease over time, although they may increase if filling is resumed in a dormant cell or when cover soils are applied, 2) the flow rates are dependent on filling rates and initial moisture content of the compacted clay component of the area being filled, and 3) short term fluctuations in rates (e.g. weekly or daily) may be large compared to average monthly rates. Evaluating the volume rate data as an indication of performance of the primary liner must take into account the expected behavior of LDCRS.

The volume data for each individual LDCRS are evaluated by comparing each monthly rate to a maximum expected rate, which is based on a moving window to account for trends or fluctuations. The maximum expected rate is defined as the mean plus three standard deviations calculated from the previous two years of average daily flow rate data for each sump, individually. It must be noted that an exceedance of the maximum expected rate may be a normal response to an increase in the filling rate or the return to active filling over an area which has not received waste for a period of time. Monthly volumes that result in an exceedance of an expected rate must not be used in subsequent expected volume calculations unless they can be demonstrated to be associated with changes in filling rates or filling location. The volume data and statistical flow limits must be reported to the EGLE with each quarterly report. However, if the monthly volume yields a rate greater than the maximum expected rate,

then a sample must be collected and analyzed for the parameters listed on Attachment D as soon as practical (allowing time for sump to recharge) unless it can be demonstrated to EGLE that the increase is due to changes in filling rates or filling location in the affected cell. EGLE must be notified of the nature of the exceedance and the intention to resample.

7.2 Evaluation of Field Specific Conductance Data

The monthly specific conductance data from each LDCRS sump must be evaluated for increases compared to recent data. This is done by comparing the measured specific conductance to the mean plus three standard deviations calculated from the previous eight conductance measurements from that sump. Monthly specific conductance data that result in an exceedance of an expected rate must not be used in subsequent statistical calculations unless they can be demonstrated to be associated with changes in filling rates or filling location. If the measured conductance exceeds this value then a sample must be collected and analyzed for the parameters listed on Attachment D as soon as practical unless the conductance measurement was collected at the time of the quarterly sample collection. EGLE must be notified of the nature of the exceedance and the intention to resample.

7.3 Analytical Data Evaluation

All quarterly analytical results must be evaluated statistically and reported to the EGLE within 60 days of the completion of each sampling event. The statistical program for the LDCRS monitoring results is presented in Attachment F. In addition to the use of statistics to evaluate the occurrence of organic compounds, WDI also tracks the concentrations of all other monitoring parameters within a database. This database should be updated upon receipt of each set of analytical results and observed for unusual data points or trends. In addition to the analytical data, the quarterly report must also include a description of the sampling events, a table of the volume measurements, a narrative description of the results of the statistical and trend analyses, and a summary of the QA/QC information both field and laboratory.

7.4 Annual Report

An annual report must be prepared describing each sampling event, a summary of the QA/QC information, sampling documentation, an evaluation of the volume records (graphical and tabular) and analytical results, and a summary of any non-compliance or maintenance items that occurred during the previous year. This annual report must be submitted to EGLE by March 1 of the following year.

8.0 DECONTAMINATION PROCEDURES

While the landfill cells are in operation, sampling of the LDCRS requires that the sampling vehicle drive into active cells and, in some cases onto the waste. For this reason, it is important that the sampling vehicle and equipment are properly decontaminated after sampling. The sampling vehicle must be power-washed by the mobile decon unit both outside and inside prior to leaving the cell area. All disposable PPE used by sampling personnel should be removed and disposed of in an appropriate receptacle at this time as well. The glove box should be cleaned with TSP or other non-organic detergent both inside and out on at least a quarterly basis.

ATTACHMENT A
Sump Location Map

E 4.000 E 5.000 E 6.000 E 7.000 E 8.000 E 9.000

N 8.000 N 7.000 N 6.000

N

V-A V-B V-E V-C VII-A VII-B VII-C

VI-F3 VI-F4 VI-E-NE

MC VI-F2 VI-F2 MC 4 MC VI-F3 MC VI-F4 MC6EP2-NE MC 5

VI-E-NW MC6EP2-W MC6EP2-SE MC 7 VII-BS MC 9

VI-F1 MC VI-F1 MC VI-G2 MC VI-G3 MC6EP1-SW

VI-E-SW VI-E-SW VI-E-SE MC VI-G1-EP2

VI-G1 MC VI-G1 MC VI-G1-EP1 MC6 B MC6 A-N

VI-B VI-A NORTH VI-A SOUTH MC 11

VI-G4 MC VI-G4 VI-C MC6 D VI-D MC6 C MC6 A-S

MC VI-G6 MC VI-G7 VI-G5 MC VI-G5 VI-G6 VI-G7 MC 10

MC 1

Attachment A

NOTES:

1. AERIAL TOPGRAPHY BY DRONEVIEW TECHNOLOGIES
   DATE OF AERIAL: DECEMBER 08, 2023.

SCALE 0' 100' 200' 400'

REV02

LEGEND:

- EXISTING LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE COLLECTION SUMP
- EXISTING LEACHATE DETECTION SUMP RISER
- PROPOSED LEACHATE DETECTION SUMP RISER
- NEW CELL BOUNDARY LOCATION
- OLD CELL BOUNDARY LOCATION
- PROPERTY LINE LOCATION
- EXISTING CONTOUR (2 FT INTERVAL)
- EXISTING STRUCTURE / BUILDING
- EXISTING ROAD (PAVED / GRAVEL)
- GRID COORDINATES
- REVISION NUMBER

REVISIONS			
REV	DATE	DRN	APP
02	04-30-24	BA	XZ
01	10-28-22	BA	XZ
00	2-9-21	XZ	
DATE:			
DESIGNED BY:		BDA	
DRAWN BY:		HS	
CHECKED BY:		XZ	
APPROVED BY:		AMY	

02 CHANGE LD AND LEACHATE SUMPS OF F3 FROM 'PROPOSED' TO 'EXISTING' AND UPDATE TOPO
01 CHANGE LD AND LEACHATE SUMPS OF F1 AND F3 FROM 'PROPOSED' TO 'EXISTING'
REVISION DESCRIPTION

CTI and Associates, Inc.
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WAYNE DISPOSAL SITE NO. 2
WAYNE, MICHIGAN

LEACHATE COLLECTION AND LEAK DETECTION LOCATIONS

PROJECT NUMBER 1218070066
SCALE 1" = 200'
DRAWING NO

TIME PLOTTED: 3:15:51 PM
DATE PLOTTED: 4/30/2024
FILENAME: C:\Shared\Site\Commercial\US Ecology\WDV\CAD\Site\Monitoring Plans\LEACHATE COLLECTION AND LEAK DETECTION LOCATIONS REV02.dgn

DRAWING SIZE: 24" X 36"

ATTACHMENT B

Weekly/Monthly Inspection Form

LEAK DETECTION SYSTEM INSPECTION

Cell	Meter Reading	Riser Pumped Dry?		Pump Functioning?		Meter Functioning?		Cap Secure and in Good Condition?		Cap Seals Tight?		Waste Away From Cap & Discharge?		Discharge Pipe Sealed Off?		Condition of Riser Pipes Ok?		Condition of Motor Controller Ok?		No Evidence of Tampering?	
		Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
6AS																					
6AN																					
6B																					
6C																					
6D																					
6E-SE																					
6E-SW																					
6E-NW																					
6E-NE																					
6G																					
F1																					
F2																					
F3																					

INSPECTOR: _____ **DATE:** _____

Comments: _____

_____

_____

DESCRIBE ANY ITEM THAT WAS CHECKED "NO" AND/OR PROVIDE OTHER COMMENTS/OBSERVATIONS:

ATTACHMENT C

Handling Requirements of Monitoring Parameters

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ATTACHMENT D

Reporting Limits for Organic & Inorganic Parameters

METHODS AND REPORTING LIMITS - ORGANIC ANALYSIS

Parameter	Sample Preparation Method	Analytical Method	Reporting Limit (mg/l)
Acetone	---	EPA 8260B	0.020
Bromodichloromethane	---	EPA 8260B	0.001
Bromoform	---	EPA 8260B	0.001
Bromomethane	---	EPA 8260B	0.005
Carbon Disulfide	---	EPA 8260B	0.005
Carbon tetrachloride	---	EPA 8260B	0.001
Chlorobenzene	---	EPA 8260B	0.001
Chloroethane	---	EPA 8260B	0.005
2-Chloroethylvinyl Ether	---	EPA 8260B	0.010
Chloroform	---	EPA 8260B	0.001
Chloromethane	---	EPA 8260B	0.001
Dibromodifluoromethane	---	EPA 8260B	0.001
1,2 Dichlorobenzene	---	EPA 8260B	0.001
1,3 Dichlorobenzene	---	EPA 8260B	0.001
1,4 Dichlorobenzene	---	EPA 8260B	0.001
1,4-Dioxane	---	EPA 8260B	0.005
Dichlorodifluoromethane	---	EPA 8260B	0.001
1,1-Dichloroethane	---	EPA 8260B	0.001
1,2-Dichloroethane	---	EPA 8260B	0.001
1,1-Dichloroethene	---	EPA 8260B	0.001
1,2-Dichloroethene	---	EPA 8260B	0.001
1,2 Dichloropropane	---	EPA 8260B	0.001
cis-1,3 Dichloropropene	---	EPA 8260B	0.001
trans-1,3 Dichloropropene	---	EPA 8260B	0.001
1,1,1,2, Tetrachloroethane	---	EPA 8260B	0.001
1,1,2,2, Tetrachloroethane	---	EPA 8260B	0.001
Tetrachloroethene	---	EPA 8260B	0.001
1,1,2-Trichloroethane	---	EPA 8260B	0.001
1,1,1-Trichloroethane	---	EPA 8260B	0.001
Trichloroethene	---	EPA 8260B	0.001
Trichlorofluoromethane	---	EPA 8260B	0.001
Vinyl Chloride	---	EPA 8260B	0.001
Methylene Chloride	---	EPA 8260B	0.005
2- Butanone (MEK)	---	EPA 8260B	0.005
Benzene	---	EPA 8260B	0.001
Toluene	---	EPA 8260B	0.001
Ethylbenzene	---	EPA 8260B	0.001
Total Xylenes	---	EPA 8260B	0.003
PCB-1016	EPA 3510C	EPA 8082A	0.0001
PCB-1221	EPA 3510C	EPA 8082A	0.0001
PCB-1232	EPA 3510C	EPA 8082A	0.0001
PCB-1242	EPA 3510C	EPA 8082A	0.0001
PCB-1248	EPA 3510C	EPA 8082A	0.0001
PCB-1254	EPA 3510C	EPA 8082A	0.0001
PCB-1260	EPA 3510C	EPA 8082A	0.0001

EPA methods from TEST METHODS FOR EVALUATING SOLID WASTE, USEPA SW-846
SM methods from STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER
Reporting Limits are Target Detection Limits per Op Memo OWMRP 111/115-8

METHODS AND REPORTING LIMITS FOR INORGANIC PARAMETERS

PARAMETER	Reporting Limit (mg/L)	SAMPLE PREP METHOD	ANALYTICAL METHOD
TOTAL PHENOLICS	0.01	EPA 420.4	EPA 420.4
SULFATE	2	---	SM 4500-SO4 E-11
TOTAL ALKALINITY	10	---	SM 2320B-11
CHLORIDE	1	---	SM 4500-Cl E-11
NITRATE/NITRITE	0.01	---	SM 4500 NO3 F-11
ALUMINUM	0.05	EPA 3010A	EPA 6010C
ANTIMONY	0.001	EPA 3020A	EPA 6020A
ARSENIC	0.001	EPA 3020A	EPA 6020A
BARIUM	0.005	EPA 3010A	EPA 6010C
BERYLLIUM	0.001	EPA 3020A	EPA 6020A
CADMIUM	0.0002	EPA 3020A	EPA 6020A
CALCIUM	1	EPA 3010A	EPA 6010C
CHROMIUM	0.001	EPA 3020A	EPA 6020A
HEX. CHROMIUM	0.005	---	EPA 7196A
COBALT	0.015	EPA 3020A	EPA 6020A
COPPER	0.01	EPA 3010A	EPA 6010C
IRON	0.02	EPA 3010A	EPA 6010C
LEAD	0.001	EPA 3020A	EPA 6020A
MAGNESIUM	1	EPA 3010A	EPA 6010C
MANGANESE	0.005	EPA 3020A	EPA 6020A
MERCURY	0.0002	EPA 7470A	EPA 7470A
MOLYBDENUM	0.025	EPA 3020A	EPA 6020A
NICKEL	0.002	EPA 3010A	EPA 6010C
POTASSIUM	0.1	EPA 3010A	EPA 6010C
SELENIUM	0.001	EPA 3020A	EPA 6020A
SILVER	0.0002	EPA 3020A	EPA 6020A
SODIUM	1	EPA 3010A	EPA 6010C
THALLIUM	0.002	EPA 3020A	EPA 6020A
TIN	0.2	EPA 3020A	EPA 6020A
VANADIUM	0.002	EPA 3020A	EPA 6020A
ZINC	0.01	EPA 3010A	EPA 6010C
pH	N/A	---	SM 4500-H+ B-11
BICARBONATE	10	---	SM 2320B-11
CARBONATE	10	---	SM 2320B-11
TOTAL CYANIDE	0.005	EPA 9014	EPA 9014
AMENABLE CYANIDE	0.005	EPA 9014	EPA 9014
TOTAL ORGANIC CARBON	0.2	---	SM 5310C-11
SPEC. CONDUCTANCE	5 (umhos/cm)	---	SM 2510B-11

EPA methods from TEST METHODS FOR EVALUATING SOLID WASTE, USEPA SW-846
SM methods from STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER
Reporting Limits are Target Limits per Op Memo OWMRP 111/115-8

ATTACHMENT E
Chain-of-Custody

Attachment E

Pace Analytical®
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

Section A
Required Client Information:

Company:	
Address:	
Email To:	
Phone:	Fax:
Requested Due Date/TAT:	

Section B
Required Project Information:

Report To:
Copy To:
Purchase Order No.:
Project Name:
Project Number:

Section C
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location
STATE: _____

Requested Analysis Filtered (Y/N)

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes
MATRIX / CODE

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

ITEM #	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COLLECTED: COMPOSITE START TIME	COLLECTED: COMPOSITE END/GRAB DATE	COLLECTED: COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Y/N	Analysis Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER:

DATE Signed (MM/DD/YY):

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

Instructions for completing Chain of Custody (COC)

1. **Section A and B:** Complete all Client information at top of sheet: company name, address, phone, fax, contact (the person to contact if there are questions, and who will receive the final report.), e-mail address (if available), PO#, Project Name and/or Project Number as you would like to see it appear on the report.

2. **Section C:** Invoice Information: Billing information is included in this section. This information should include the name and address of the person receiving the invoice.

3. Quote Reference should be completed if a quotation was provided by Pace Analytical. The Project Manager, and Profile No. will be completed by Pace Analytical Services.

4. **Site Location:** A separate COC must be filled out for each day of sample collection. Record the two letter postal code for the US state in which the samples were collected.

5. **Regulatory Agency:** List the program that is guiding the work to ensure proper regulations are followed.

6. **Section D:** Complete a Sample Description in the "SAMPLE ID' section as you would like it to appear on the laboratory report. The following information should also be included: the sample matrix, sample type (G (grab) or C (composite). When collecting a composite, the start time and end time should be documented in the respective boxes. The collection time for a grab (G) sample should be entered in the boxes marked 'Composite End/Grab'), Sample temp at collection (if required by state), the total number of containers, and preservative used.

7. Mark if the sample was filtered in the field by marking Y or N in 'Filtered' row by the Analysis requested.

8. Requested Analysis: List the required analysis and methods on the lines provided and place a check in the column for the samples requiring the analysis. Additional comments should be referenced in the bottom left hand corner or include attachments for extended lists of parameters.

9. The sampler should print their name in the space provided and sign their name followed by the date of the sampling event at the bottom of the COC in the spaces designated for 'SAMPLER NAME AND SIGNATURE'.

10. When relinquishing custody of the samples to a representative of the laboratory or other organization, indicate the Item Numbers of those samples being transferred; sign relinquished by, date and time, and include your affiliation.

***Important Note:**

Standard Turnaround Time is 2 Weeks/10 business days. Results will be delivered by end of business on the date due unless other arrangements have been made with your project manager.

Special Project Requirements such as Low Level Detection Limits or level of QC reported must be included on the chain of custody in the Additional Comments section.

ATTACHMENT F

Statistical Program for the LDCRS

Attachment F - LDCRS Statistical Monitoring Plan

STATISTICAL EVALUATION

The statistical program for LDCRS monitoring utilizes Nonparametric Prediction Limits (NPPLs) to evaluate the monitoring data. To balance false positive and statistical power with this test, resamples are used, the number of which are determined by the number of sampling points and the number of background observations. Since there is no “upgradient” in the LDCRS system, and there was no substantial pre-waste disposal sampling program, the definition of background is not defined in a traditional sense. The NPPL is defined as the highest concentration of a monitoring parameter detected in a background sample. For parameters that are never detected in the background, the NPPL is defined as the reporting limit. Since the parameters to be analyzed statistically are all organic compounds, the reporting limit, as listed on Attachment D of the LDCRS Sampling and Analysis Plan are the NPPLs. Therefore, any reported concentration of an Attachment E parameter at or above these limits is considered an apparent statistically significant increase.

For PCBs at the LDCRS for Cell VI-AN, vinyl chloride for Cell VI-B the NPPLs are the maximum concentrations detected in these cells. For Cell VI-AN, the source of PCBs was contamination during the repair of a collapsed LDCRS riser pipe. Low levels of PCBs have been detected sporadically in samples since this work was completed. The NPPL for PCBs at Cell VI-AN is 0.00017. For Cell VI-B, the source of vinyl chloride was never determined but it has been determined to not have been due to a release through the liner. The NPPL for vinyl chloride at Cell VI-AN is 0.002.

If an Attachment D compound is detected above the NPPL, this constitutes an apparent statistically significant increase (SSI) and WDI must notify the Materials Management Division (MMD) of the Michigan Department of Environment, Great Lakes and Energy (EGLE) within 24 hours, and arrange resampling as soon as possible to confirm or refute the apparent statistically significant increase. Quadruplicate samples will be collected for confirmation purposes and analyzed for the offending parameter(s). Since these quadruplicates are not independent samples, it does not constitute a multiple resampling as defined by the NPPL test. Thus, the quadruplicate samples constitute a single resampling. If three of the four quadruplicate samples are clean, then the statistical increase is not confirmed. If two or more of the quadruplicates contain the compound of interest the apparent increase will be deemed confirmed and WDI shall respond in accordance with the current Operating License.

For Cell VI-ENW, the detection of landfill gas parameters acetone, vinyl chloride and 1,1-dichloroethane will require WDI to monitor the riser pipe for the presence of methane and investigate the active gas collection system to determine the cause and repair or recalibrate the system. Monthly monitoring will occur during (assuming methane levels are safe for operating the pump) and after this process until three “clean” samples are collected. Cells VI-ESE and VI-AN were impacted by contact water and the effects are still seen in the major ion chemistry. This compromises the usefulness of these data. However, VOCs have not been detected for years and can be used as NPPL criteria.

Attachment B5.E

LYSIMETER MONITORING SAMPLING AND ANALYSIS PLAN

WAYNE DISPOSAL SITE #2 HAZARDOUS WASTE LANDFILL
MID 048 090 633
Revision 1

LYSIMETER MONITORING SAMPLING AND ANALYSIS PLAN

WAYNE DISPOSAL SITE #2 HAZARDOUS WASTE LANDFILL
MID 048 090 633

1.0 INTRODUCTION

The following sampling and analysis plan outlines the procedures to be used for the collection and analysis of samples from the suction lysimeters present beneath the hazardous waste management areas (HWMA) of Master Cells V and VII at Wayne Disposal Site #2 Hazardous Waste Landfill. The lysimeter monitoring program functions as an early leak detection program beneath the lowest point (leachate collection sumps) of the HWMA subcells within these Master Cells. There are ten lysimeters in place. They were installed as five pairs so that adequate volume could be extracted for samples at each location. Pairs are located beneath Cells V-B, VII-A, VII-B and VII-C (2 pairs identified as VII-C west and VII-C east). The locations of the lysimeters are shown on Figure 1.

This sampling and analysis plan has been prepared to direct the efforts of monitoring personnel in the collection and analysis of samples so as to meet the requirements of Michigan Act 451, Part 111 for the facility and to confirm sound practices for the collection of these data. This plan must be revised if there are any changes to the procedures contained herein. Any proposed changes must be submitted to the Materials Management Division (MMD) of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for review and approval before the changes are implemented..

2.0 DESCRIPTION OF EQUIPMENT

A lysimeters is a monitoring device that is used to collect pore liquids under either satutated or unsaturated conditions, such that they can be utilized in low permeability soils. A suction lysimeter functions by using a vacuum to reduce the pore-pressure in the soil surrounding the lysimeter to assist with drawing pore liquid into the lysimeter. The sampling process involves applying a vacuum to the system to draw moisture into the lysimeter, transferring the water from the lysimeter to the transfer vessel and then applying pressure to the transfer vessel to drive the sample to the surface. The lysimeters at WDI were placed beneath the cells by drilling at an angle of approximately 65° from vertical to a depth approximately 50 feet below ground surface and at least 5 feet below the lowest point of the bottom of the cell. A drawing of a typical installation is shown on Figure 2. The suction lysimeter system consists of a lysimeter, which takes in the moisture from the surrounding soil, vacuum tubing, and a transfer vessel at mid-depth. The transfer vessel is required because of the depth of the lysimeters; the pressure applied to the lysimeter is not powerful enough to bring the sample all the way to the surface so the sample is initially brought to mid-depth and then additional pressure is applied to the vessel at mid-depth to bring the sample to the surface. The lysimeters were manufactured by Timco Manufacturing and are composed entirely of Teflon™ , as is the tubing and transfer vessel. There is a 2-inch PVC casing attached to the transfer vessel. The "sand-pack" placed around the lysimeter is a silica flour slurry. The whole system is cased in a 6-inch steel casing to within four feet of the lysimeter assembly. Bentonite pellets were used to seal the lysimeter and silica pack from possible seepage from above. At the surface there are three lines with stop-cocks:

(one with a pressure gauge) for depressurizing the lysimeter, one to depressurize the transfer vessel and one for transmitting the sample.

3.0 SAMPLE COLLECTION PROCEDURES

Samples of the water gathered by the lysimeters are collected on a semi-annual basis. As also described above, the sampling process involves applying a vacuum to the system to draw moisture into the lysimeter, transferring the water from the lysimeter to the transfer vessel and then applying pressure to the transfer vessel to drive the sample to the surface. This is generally a 3-day process. During the first day, the system is checked to confirm the gauge is in working order. Then, the initial vacuum is set by opening the stop-cock on the line with the pressure gauge and applying 10-20 psi using a hand pump. The stop-cock is then closed. On the second day, the same sequence is repeated. To sample the system on the third day, a breathable quality compressed air tank or nitrogen tank is attached to the line with the gauge. The stop-cocks on each line are opened. Approximately 8-10 psi of breathable quality compressed air is applied for 2-3 minutes. The compressed gas tank is then attached to the transfer vessel pressure line and approximately 25-30 psi of breathable quality compressed air is applied`. The sample will be discharged from the sample line. The samples are collected and the stopcocks are closed. Samples from pairs may be composited if insufficient sample is collected from a single lysimeter.

Protective gloves must be worn during sample collection and care should be taken to ensure minimal agitation/aeration of the samples. The vials must be filled completely with zero head-space. Each sample container must be carefully labeled with the sampling location, time and date, and the sampler's initials. After collection, the samples must be stored in a clean cooler containing ice or ice packs. The coolers containing samples must be stored in a secure location until transport to the laboratory.

A field blank must be collected with each lysimeter sample collected. A trip blank must be maintained for each day the lysimeters are sampled. Due to the difficulty in getting sufficient sample for analysis, duplicate samples are not collected for the lysimeter monitoring program.

A chain of custody form must be completed for each sampling event. This form must be filled out fully for each sample submitted for analysis and each person responsible for the handling of these samples must sign and date the form. When the samples are delivered to the laboratory and the lab has signed for their receipt, a copy of this form must be forwarded to the Environmental Manager. .

4.0 SAMPLE ANALYSIS

Each sample must be analyzed for the parameters listed on Figure 3, which also contains the analytical methods and target reporting limits. Laboratory Quality control frequencies and precision/accuracy requirements are provided in the Quality Assurance Manual for the current contract laboratory. , which is contained in the Groundwater Sampling and Analysis Plan for this facility. This manual is not intended to describe the specific details of this particular monitoring program. Rather, we are to use this document as a guideline in evaluating the current laboratory's QA/QC and standard operating procedures to ensure that generally acceptable practices are employed.

5.0 RECORD KEEPING AND INSPECTION REQUIREMENTS

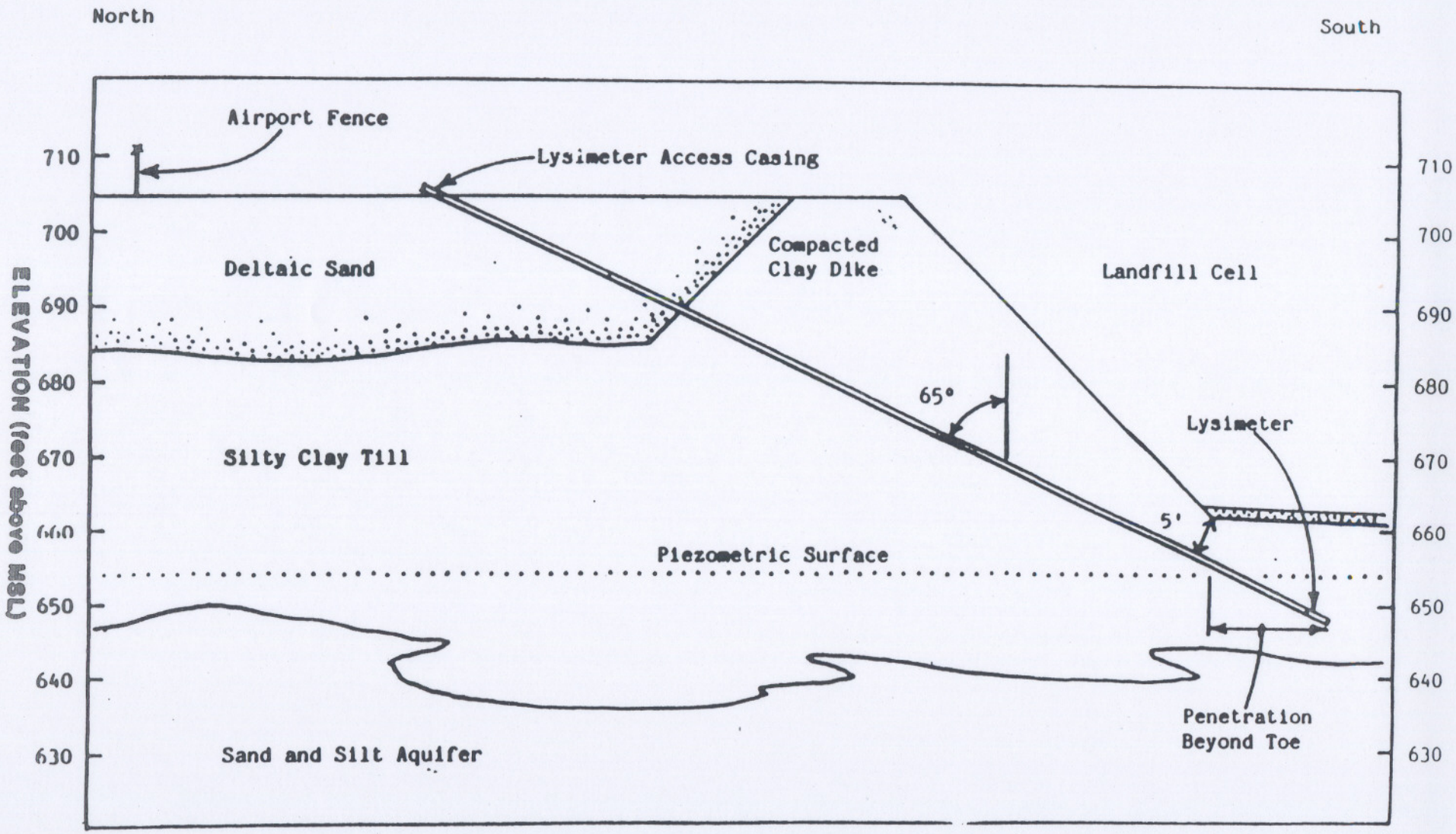
There are two items required to ensure adequate record keeping for the lysimeter monitoring program. First, the lysimeter sampling and inspection log (Figure 4) must be filled out at each sampling location during each sampling event. The log must include the identity of sampling personnel, the dates and time when samples are collected, a description of the sampling event, and any pertinent observations of sample characteristics or sampling environment. In addition, this form must be used to record an inspection of the lysimeter outlet including the pressure gauges, stopcocks and the outer protective casing. Second, a chain of custody form must be filled out for each sampling event, as described above. This form must be filled out fully for each sample submitted for analysis and each person responsible for the handling of these samples must sign and date the form.

6.0 DATA EVALUATION AND REPORTING REQUIREMENTS

The data must be received from the laboratory, evaluated and transmitted to the EGLE within 60 days of sampling. The statistical analysis of the data is identical to that for the leak detection, collection, and removal system (LDCRS) monitoring program and is provided as Attachment A. An apparent statistically significant increase identified by the statistical test must be reported to EGLE within 24 hours. An apparent statistically significant increase must be confirmed or refuted by resampling. Based on experience, the lysimeters do not recharge for at least several months. Any lysimeter yielding an apparent statistically significant must be resampled within 3 months unless insufficient sample can be collected. If there is insufficient sample within 3 months, the lack of available liquid must be reported to EGLE along with a schedule for attempting the next sample. Confirmed statistically significant increases must be transmitted within 24 hours to EGLE.

The semi-annual reports must include a description of the sampling event, a summary of field and laboratory QA/AC information, the field logs and a summary of any non-compliances or maintenance performed.

THE ENVIRONMENTAL QUALITY COMPANY
LOCATION: WAYNE DISPOSAL SITE #2
SCALE: 1" = 300'
DATE: 10/11/95
TITLE: LYSIMETER LOCATION PLAN
FILENAME: WDS2LYS
E 5000
E 6000
E 7000
N 9000
N 8000
VI-B
VII-A
VII-B
VII-CW
VII-CE
PROPERTY LINE
MASTER CELL V
MASTER CELL VII
HAZARDOUS WASTE BOUNDARY
APPROXIMATE CELL BOUNDARY



Lysimeter Installation Geometry at Wayne Disposal.

(HORIZONTAL NOT TO SCALE)

Figure 2

FIGURE 3. METHOD DETECTION LIMITS - ORGANIC ANALYSIS

Parameter	Method Reference	Detection Limit (mg/l)
Acetone	8260B	0.020
Bromodichloromethane	8260B	0.001
Bromoform	8260B	0.001
Bromomethane	8260B	0.005
Carbon tetrachloride	8260B	0.001
Chlorobenzene	8260B	0.001
Chloroethane	8260B	0.005
2-Chloroethylvinyl Ether	8260B	0.010
Chloroform	8260B	0.001
Chloromethane	8260B	0.001
Dibromodifluoromethane	8260B	0.001
1,2 Dichlorobenzene	8260B	0.001
1,3 Dichlorobenzene	8260B	0.001
1,4 Dichlorobenzene	8260B	0.001
Dichlorodifluoromethane	8260B	0.001
1,1-Dichloroethane	8260B	0.001
1,2-Dichloroethane	8260B	0.001
1,1-Dichloroethene	8260B	0.001
1,2-Dichloroethene	8260B	0.001
1,2 Dichloropropane	8260B	0.001
cis-1,3 Dichloropropene	8260B	0.001
trans-1,3 Dichloropropene	8260B	0.001
1,1,1,2, Tetrachloroethane	8260B	0.001
1,1,2,2, Tetrachloroethane	8260B	0.001
Tetrachloroethene	8260B	0.001
1,1,2-Trichloroethane	8260B	0.001
1,1,1-Trichloroethane	8260B	0.001
Trichloroethene	8260B	0.001
Trichlorofluoromethane	8260B	0.001
Vinyl Chloride	8260B	0.001
Methylene Chloride	8260B	0.005
2- Butanone (MEK)	8260B	0.005
Benzene	8260B	0.001
Toluene	8260B	0.001
Ethylbenzene	8260B	0.001
Total Xylenes	8260B	0.003

Note: Detection limits meet those in MDEQ Operational Memo Gen-8 Revision 8 - 12/22/06. This table should be revised in the event Op Memo Gen-8 is updated

Reference: Methods referenced from TEST METHODS FOR EVALUTION SOLIDS WASTE, USEPA SW-846

Figure 4. Lysimeter Sample Collection and Inspection Log - WDI Site #2

Sample ID:	**Sample Date:**	**Sample Time:**
Sample Location:	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		
Inspection Items: (indicate by checkmark if OK, comment if not) **Pro-Casing:_____ Gauge:_____ Stopcocks:_____**		

Sample ID:	**Sample Date:**	**Sample Time:**
Sample Location:	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		
Inspection Items: (indicate by checkmark if OK, comment if not) **Pro-Casing:_____ Gauge:_____ Stopcocks:_____**		

Sample ID:	**Sample Date:**	**Sample Time:**
Sample Location:	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		
Inspection Items: (indicate by checkmark if OK, comment if not) **Pro-Casing:_____ Gauge:_____ Stopcocks:_____**		

Sample ID:	**Sample Date:**	**Sample Time:**
Sample Location:	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		
Inspection Items: (indicate by checkmark if OK, comment if not) **Pro-Casing:_____ Gauge:_____ Stopcocks:_____**		

* Note clarity of samples and any color, sheen, odor or other relevant characteristics of the sample

Attachment A
Statistical Analysis

Attachment A – Lysimeter Statistical Monitoring Plan

INTRODUCTION

The following statistical monitoring plan provides a description of the statistical procedures used for identifying a statistically significant increase of monitoring parameters in the lysimeter monitoring program at WDI. The program is intended to provide an early warning that hazardous waste constituents may be penetrating the liner systems of cells V-B, VII-A, VII-B and VII-C East and VII-C West. These cells were constructed prior to the requirement of a double-composite liner; therefore the lysimeters function as a leak detection system.

STATISTICAL EVALUATION

The statistical program for lysimeter monitoring utilizes Nonparametric Prediction Limits (NPPLs) to evaluate the monitoring data. In order to balance false positive and statistical power with this test, resamples are used, the number of which are determined by the number of sampling points and the number of background observations. Since there is no "upgradient" in the lysimeter network, and there were no pre-waste disposal samples collected from these devices, the definition of background is not defined in a traditional sense.

For parameters that are never detected in the background, the NPPL is defined as the reporting limit. Since the parameters to be analyzed statistically are all volatile organic compounds, the reported detection limit, as listed on Figure 3 of the Lysimeter Sampling and Analysis Plan are the NPPLs. Therefore, any reported concentration of a Figure 3 parameter at or above these limits is

considered an apparent statistically significant increase.

If a Figure 3 compound is detected, then the NPPL has been exceeded and WDI will immediately notify the Materials Management Division (MMD) of the Michigan Department of Environment, Great Lakes and Energy (EGLE) and arrange resampling as soon as possible to confirm or refute the apparent statistically significant increase. Quadruplicate samples, if there is sufficient volume, will be collected for confirmation purposes and analyzed for the offending parameter(s). Since these quadruplicates are not independent samples, it does not constitute a multiple resampling as defined by the NPPL test. Therefore, the quadruplicate samples constitute a single resampling. If three of the four quadruplicate samples are clean, then the statistical increase is not confirmed. If two or more of the quadruplicates contain the compound of interest the apparent increase will be deemed confirmed and WDI shall respond in accordance with the current Operating License.

ATTACHMENT B5.F

SURFACE WATER SAMPLING AND ANALYSIS PLAN
WAYNE DISPOSAL, INC.

REVISION 2025

1.0 INTRODUCTION

This Surface Water Sampling and Analysis Plan (SW SAP) identifies the procedures to be used for monitoring on-site surface water (storm water) samples from the perimeter ditches that convey on-site surface water run-off at Wayne Disposal, Inc. (WDI) Site 2 to the North, Northwest and South Sedimentation Basins. All surface water collected in these sedimentation basins is treated by sedimentation, filtration, and activated carbon adsorption prior to discharge to off-site surface water (Quirk Drain). The effluent from this treatment process is discharged into Quirk Drain in accordance with a National Pollutant Discharge Elimination System (NPDES) permit MI0056413.

The surface water monitoring program described by this SW SAP is designed to test the quality of the on-site surface water to determine if hazardous waste or hazardous waste constituents are present within the surface water. If these constituents are detected or exceed statistical limits, the plan outlines the notification and response actions that WDI must take. This monitoring program is one of the checks on the engineered controls and operational procedures employed by WDI to detect an on-site release of hazardous waste or hazardous waste constituents as early as possible and allow WDI to initiate efforts to locate and control the source and prevent the off-site release of hazardous waste or hazardous waste constituents.

2.0 REVISIONS

WDI may revise this SW SAP and submit the revised plan to the Chief of the Materials Management Division (MMD) of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for review and approval prior to implementation.

3.0 SAMPLE LOCATIONS

Surface water grab samples are currently collected from each of the eight permanent locations shown on Figure 1 designated as SS-1, SS-2, SS-5, SS-6, SS-7, SS-9, SS-10 and SS-11. Location SS-3 is the effluent from the treatment system and is monitored in accordance with an NPDES permit and the TSCA Approval per 40 CFR 761.75 for the facility. SS-4 was abandoned due to changes to the drainage system at the site. Location SS-8 was abandoned due to the construction of MC VI-F4. Location SS-12 will be added to the program when MC-VI-G Phase 3 is constructed.

4.0 SAMPLE FREQUENCY

Each surface water sample location in the program is to be sampled once during each calendar quarter following a rain event (defined as a 0.5 inches or more in 24 hours) when enough surface water is present within the ditches to collect a representative sample. Surface water samples will not be collected within a calendar quarter if there are no significant rain events that allow for the sampling to be completed.

5.0 SAMPLE COLLECTION

Surface water grab samples for each of the required parameters are to be collected from each of the sampling locations. Samples for volatile organic compounds (VOCs) are to be collected first and require zero headspace (no air bubbles) and minimal agitation of the water sample. Samples for PCBs are collected next followed by total phenolics and then the remaining parameters. Duplicate samples must be collected at each sample location for VOCs, PCBs and metals. The duplicate samples are to be held by the laboratory as potential confirmation samples to be analyzed in the event of an apparent statistically significant increase (ASSI) using the criteria defined in Section 7.0 of this SW SAP. The duplicate sample for PCBs must be extracted when it arrives at the laboratory and the extract held in case a confirmation analysis is required. The lab may elect to analyze duplicate samples upon receiving them to avoid potential hold-time exceedances.

Samples are to be collected by direct fill by dipping the bottles provided by the laboratory into the water and directly filling the containers. If site conditions do not allow for sampling in this way, a disposable plastic cup can be used to collect the sample and the sample then carefully decanted into the sample bottles. Care must be taken to ensure that any preservatives in the bottles are not spilled during sample collection. Field measurements of pH, specific conductance, temperature and dissolved oxygen are collected with calibrated field instruments at the time of sampling. The use and maintenance instructions of the field instruments contained in the Groundwater Sampling and Analysis Plan also apply to the equipment used to collect field measurements under this SW SAP.

Protective gloves must be worn during sample collection and clean gloves must be used at each sample location. Care should be taken at all times when handling the samples. Samples to be analyzed for volatile organic compounds require zero-headspace, no air bubbles and minimal agitation of the sample. Samples collected for metals analyses are not to be filtered as the metals are "totals" analyses. Each sample container must be carefully labeled with the sampling location, time and date, and the sampler's initials. Field Quality Assurance/Quality Control (QA/QC) samples must include:

- One trip blank in each cooler utilized for storing and shipping samples. The trip blank must be analyzed for VOCs and PCBs.
- One field blank for each day in which samples are collected. The field blank samples are to be collected by filling an identical set of sample bottles at a given location with clean deionized water. The field blank samples must be analyzed VOCs and PCB.
- One blind duplicate for each sampling event. The duplicate must be collected by filling an identical set of sample bottles at a given location and submitting them for an identical analysis as the parent sample.
- One equipment blank for the disposable cups (if used) is prepared by filling a disposal cup with water provided by the laboratory and decanting the water into the sample containers. The equipment blank (if collected) must be analyzed for VOCs and PCBs.

After collection, the samples must be stored in a clean cooler containing ice or ice packs. The coolers containing samples must be stored in a secure location until being transported to the laboratory.

A sample collection log (Figure 2) must be filled out at each sampling location and any unusual conditions (e.g. odors, sheens) encountered must be noted. A chain of custody (COC) form that lists each sample submitted to the laboratory must be fully filled out for each sampling event and each person who has custody of the samples, from sample collection through sample check-in, must sign and date the form. When the samples are delivered to the laboratory and the laboratory has signed for their receipt, a copy of this form must be retained on site.

6.0 SAMPLE ANALYSIS

One surface water grab sample from each of the required sampling locations must be analyzed for the parameters listed on Table 1 using the analytical methods and reporting limits (i.e., target reporting limits) specified in Table 1, which are consistent with Policy and Procedure Document OWMRP-111/115-8. The potential confirmation duplicate samples from each surface water sampling location must be retained at the laboratory but need only be analyzed if an ASSI is detected in the first sample using the criteria described in Section 7.0 of this SW SAP. The laboratory may elect to analyze the duplicate samples when received in order to avoid hold-time exceedances.

In some cases, the laboratory may not be able to attain the reporting limits specified due to factors such as sample dilution or matrix effects. If this is the case, the laboratory report must include an explanation for not achieving the specified reporting limits.

The laboratory QA/QC Manual, describes the required internal policies, guidelines and procedures of any contract lab used by WDI to evaluate the QA/QC standard operating procedures of any contract laboratory utilized for the purposes of this SW SAP. WDI ensures that the laboratory employs acceptable QA/QC practices. The laboratory QA/QC Manual is included in the EGLE approved Groundwater Monitoring SAP.

7.0 DATA EVALUATION

The analytical data from the surface water samples is to be evaluated as follows:

- For VOCs, any reported concentration at or above the reporting limit is an apparent statistically significant increase (ASSI). The only exception is for 1,1-dichloroethane as outlined in Attachment A.
    - For PCBs, any reported concentration at or above 0.5 mg/L is an ASSI.
- For metals and inorganic parameters, the data will be evaluated using the sign test, as described in Attachment A. In addition, a ten-fold increase in concentration for any metal or inorganic parameter between sampling events in any of the individual grab samples is considered an ASSI.

Any PCBs or VOC detection at the NPDES discharge location (SS-3), which is monitored monthly in accordance with WDI's TSCA Approval, must be reported as an ASSI as outlined in Section 8 of this document and WDI's Part 111 Operating License.

8.0 RESPONSE ACTIONS

In the event of an ASSI, WDI must verbally notify the EGLE, Hazardous Waste Program Section staff immediately in accordance with the Environmental Monitoring Conditions of the Operating License and WDI must also implement the procedures identified below to confirm the ASSI.

- If a VOC is present in a sample above its method detection limit, the duplicate sample must be analyzed.
- If a metal in any grab sample has met or exceeded ten times increase criteria identified in Section 7.0, an ASSI has occurred and the duplicate sample must be analyzed for the offending parameter(s) .
- If PCBs have met or exceeded the criteria identified in Section 7.0, an ASSI has occurred and the duplicate sample extract must be analyzed.
- If the sign test fails at any location, the sample location must be inspected closely and resampled as soon as there is sufficient water to sample. The results of the resample will be analyzed for all sign test parameters.

If an ASSI is not repeated, WDI will resume routine monitoring. If the ASSI is repeated upon analyzing the second sample, a confirmed statistically significant increase (CSSI) has occurred. In the event of a CSSI, WDI must notify the EGLE in accordance with the General Operating Conditions of the Operating License for Reporting Noncompliance that may endanger human health or the environment. Further, within 30 days of becoming aware of a CSSI, WDI must:

- Determine whether a discharge of hazardous waste and/or hazardous waste constituents to off-site surface waters is occurring, determine the source, and take immediate steps to eliminate and prevent any such discharge. WDI may demonstrate a source other than the licensed facility caused the CSSI or that the CSSI resulted from error in sampling, analysis or evaluation.
- Submit a report to the EGLE documenting WDI's investigation, response, and any further response actions proposed.

9.0 REPORTING REQUIREMENTS

For quarterly reports, the final data must be received from the laboratory, evaluated and the report transmitted to the EGLE within 60 days of sampling. The report must include a narrative description of the sampling event, a map showing the locations sampled, copies of the sampling logs, a summary and discussion of the analytical data and the data statistics, a discussion of field and laboratory QA/QC, the field measurements collected (pH, specific conductance, temperature and dissolved oxygen), a description of any statistically significant events (i.e. ASSI and/or

CSSI), any resampling or additional sampling conducted as a result of a CSSI, and any additional actions proposed as a result of the reported data.

In addition to the quarterly reports, an annual summary report of surface water monitoring results must be submitted to the EGLE by March 1 of the following year. At a minimum, the annual report must contain a map showing all locations sampled, a tabular summary and discussion of the analytical data collected during the previous year, a description of any statistically significant events (i.e. ASSI and/or CSSI), any resampling of additional sampling conducted as a result of a CSSI, and any additional actions proposed as a result of the reported data.

10.0 RECORD KEEPING REQUIREMENTS

All analytical data and quarterly and annual monitoring reports must be stored on site within the Site's filing system and be available for inspection as required.

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E 5,000
E 6,000
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SS-9
SS-6
SS-7
SS-10
SS-11
SS-5
SS-2
SS-1
SS-3
SS-12

(NORTH SEDIMEN-TATION BASIN)
(NORTH SEDIMEN-TATION BASIN)
(NORTH SEDIMEN-TATION BASIN)
SOUTH SEDIMENTATION BASIN EXPANSION
WWTP
SOUTH SEDIMENTATION BASIN
LINED POND

NOTES:

1. AERIAL TOPOGRAPHY BY DRONEVIEW TECHNOLOGIES
   DATE OF AERIAL: FEBRUARY 03, 2025.
   UPDATED WITH FLYOVER FROM MARCH 31, 2025.

LEGEND:

- NEW CELL BOUNDARY LOCATION
- OLD CELL BOUNDARY LOCATION
- PROPERTY LINE LOCATION
- EXISTING CONTOUR (2 FT INTERVAL)
- EXISTING STRUCTURE / BUILDING
- PAVED / GRAVEL — EXISTING ROAD
- GRID COORDINATES
- SS 1 — SURFACE WATER SAMPLING LOCATION
- SS 12 — SURFACE WATER SAMPLING LOCATION – POST MC VI F/G CONSTRUCTION
- DIRECTION OF SURFACE WATER FLOW
- AREA A
- AREA B

SCALE 0' 100' 200' 400'

DATE:	04-14-25
DESIGNED BY:	RB
DRAWN BY:	BDA
CHECKED BY:	RB
APPROVED BY:	XZ

CTI and Associates, Inc.
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www.ctiompanies.com

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REV	DATE	REVISION DESCRIPTION	DRN	APP

WAYNE DISPOSAL SITE NO. 2
WAYNE, MICHIGAN

SURFACE WATER SAMPLING LOCATION MAP

PROJECT NUMBER 23L023
SCALE 1" = 200'
DRAWING NO 1

TIME PLOTTED: 1:54:44 PM
DATE PLOTTED: 14-Apr-25
FILENAME: C:\Shared\Box\Commercial\US Ecology\WDI\CAD\Site\Monitoring Plans\2025 MONITORING PLANS\2025 SURFACE WATER SAMPLING LOCATION MAP.dgn

DRAWING SIZE: 24" X 36"

Figure 2. Sample Collection Log for Surface Water - WDI Site #2

Sample ID:	**Sample Date:**	**Sample Time:**
Sample Location:	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		
Field Measurements: pH _____ Specific Conductance_____ Temperature_____		

Sample ID:	**Sample Date:**	**Sample Time:**
Sample Location:	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		
Field Measurements: pH _____ Specific Conductance_____ Temperature_____		

Sample ID:	**Sample Date:**	**Sample Time:**
Sample Location:	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		
Field Measurements: pH _____ Specific Conductance_____ Temperature_____		

Sample ID:	**Sample Date:**	**Sample Time:**
Sample Location:	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		
Field Measurements: pH _____ Specific Conductance_____ Temperature_____		

□□□t□ □□□rf□ □□s□□ p□□s □nd □n□ □□□□r□sh□□n□□d□r □r □th□r r□□□□□nt □h□r□□t□r□st□□s □□th□ s□□ p□□

Parameters	RL (mg/L)[3]	Sample Preparation Method	Analytical Method
Indicator Parameters			
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□tr□t□	□□□□□	□□□□	SM 4□□□□□□ □ □ □□□□
pH	□□□□□□□□□□	□□□□	SM 4□□□□H□ □□□□
Sp□□□□□ □ □nduct□n□□	□ u□ h□□s□□□ □	□□□□□□	SM □□□□□□ □□□□
Su□□t□	□	□STM D□□□□□□	SM□4□□□□S□4 □□□□
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Metals			
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VOCs	□□□□□□ t□ □□□□□□	□□□□	□P□ □□□□□
P□□s	□□□□□□□	□P□ □□□□□	□P□ □□□□□

EPA methods from TEST METHODS FOR EVALUATING SOLID WASTE, USEPA SW-846
SM methods from STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER
RLs are Target Reporting Limits per Op Memo OWMRP 111/115-8

Parameters	RL (mg/L)[3]	Sample Preparation Method	Analytical Method
Organic Parameters			
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□h□r□□□□□□n□	□□□□□□	□□□	□P□ □□□□□□
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EPA methods from TEST METHODS FOR EVALUATING SOLID WASTE, USEPA SW-846
SM methods from STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER
RLs are Target Reporting Limits per Op Memo OWMRP 111/115-8

Attachment A
Statistical Monitoring Plan for Surface Water Monitoring

Wayne Disposal, Inc., Site #2
MID 048 090 633

Revision 1.0, December 1994
Revision 1.1, October, 1999
Revision 2.0 2025

Statistical Monitoring Plan for Surface Water Monitoring

WDI Site #2 Hazardous Waste Landfill
MID 048 090 633

Revision 1.0, December 94
Revision 1.1, October 99
Revision 2.0 2025

I. Introduction

The following statistical monitoring plan provides a description of the statistical procedures to be used for identifying a statistically significant increase of monitoring parameters in the surface water monitoring program for the above referenced facility. The program is intended to determine if hazardous waste constituents may be entering the storm water run-off from non-contact areas of the facility.

II. Statistical Evaluation

The statistical program provides two procedures to be used together for each set of monitoring data. The first procedure applies to the volatile organic compounds (VOCs) and PCBs only. This procedure the non-parametric prediction limit (NPPL), which for PCBs and VOCs is generally the reporting limit. For these compounds, any occurrence above the reporting limit is considered statistically significant. The only exception to this is for the VOC 1,1-dichloroethane, which is sporadically detected at sampling location SS-2 due to its proximity to a cover drain on top of Master Cell VII. This VOC is present in the cover soils of this cell and occasionally the water percolating into the cover soil and discharging to the ditch near SS-2 will contain this compound. The NPPL for this compound in samples from SS-2 is 0.280 mg/L, the highest concentration detected. The second procedure is a comparison of the overall inorganic surface water quality to the average quality during a background period using the sign test. This procedure is described in detail below.

Statistical Sign Test - The purpose of this statistical analysis of the surface water is to determine whether the overall surface water quality during a monitoring event is statistically different compared to "background" surface water quality. To determine the statistical significance of differences between monitoring and background samples, a test know as the sign test is used. This test applies to all inorganic parameters, which will generally be present in detectable concentrations. The sign test determines if enough of these parameters are higher than the background averages to conclude that there is a statistically significant difference in water quality.

The sign test will be performed at the 0.05 significance level to determine whether a statistically significant number of parameters are present in the monitoring samples in higher concentrations than the background. To perform the sign test, following each sampling event, the concentration of each inorganic monitoring parameter at each sample location is compared to the concentration of that constituent in the background. The current background concentrations utilized for the sign test are presented on Table 2. If the concentration in the monitoring sample is higher than background, a "+" is assigned to that parameter; if the background concentration is higher, a "-" is assigned for that parameter; and if the concentrations are equal (also called a "tie"), a "0" is assigned for that parameter. The total number of "+" and "-" parameters (excluding any "ties") are then summed up, which is the value "n". Then the total number of elevated values (y), is calculated by summing up the total number of "+" values and subtracting that number from "n". The values for "n" and "y" are then used with the binomial probability table, Table 1 (below) to determine the level of significance (Alpha) for each sampling location. The resulting "Alpha" is then compared to the significance level of 0.05. If the corresponding "Alpha" is greater than 0.05, the result is not statistically significant, and that location "passes" the test, meaning no additional evaluation is necessary and routine monitoring is continued. If the "Alpha" is less than 0.05, the result is statistically significant and verification sampling should be performed at that sampling location.

For example, if there are 8 total parameters at a particular location (n = 8) and seven of the eight have concentrations that are higher than background (y = 8 - 7 = 1), the corresponding value of alpha (0.0352) is less than 0.05, which results in a failure of the test. If only 6 parameters had concentrations higher than background, the resulting alpha would have been 0.1445, which is higher than 0.05 and the test "passes" (i.e., there is no statistical evidence of impact) and routine sampling should continue.

TABLE 1
BINOMIAL DISTRIBUTION
Alpha = P[X<y] for b(X;n,0.050)

n	y	Alpha	n	y	Alpha	n	y	Alpha	n	y	Alpha
1	0	0.5000	8	0	0.0039	12	0	0.0002	15	0	0.0000
1	1	1.0000	8	1	0.0352	12	1	0.0032	15	1	0.0005
			8	2	0.1445	12	2	0.0193	15	2	0.0037
2	0	0.2500	8	3	0.3633	12	3	0.0730	15	3	0.0176
2	1	0.7500	8	4	0.6367	12	4	0.1938	15	4	0.0592
2	2	1.0000	8	5	0.8555	12	5	0.3872	15	5	0.1509
			8	6	0.9648	12	6	0.6128	15	6	0.3036
3	0	0.1250	8	7	0.9961	12	7	0.0862	15	7	0.5000
3	1	0.5000	8	8	1.0000	12	8	0.9270	15	8	0.6964
3	2	0.8750				12	9	0.9807	15	9	0.8491
3	3	1.0000	9	0	0.0028	12	10	0.9968	15	10	0.9408
			9	1	0.0195	12	11	0.9998	15	11	0.9824
4	0	0.0625	9	2	0.0898	12	12	1.0000	15	12	0.9963
4	1	0.3125	9	3	0.2539				15	13	0.9995
4	2	0.6875	9	4	0.5000	13	0	0.0001	15	14	1.0000
4	3	0.9375	9	5	0.7461	13	1	0.0017	15	15	1.0000
4	4	1.0000	9	6	0.9102	13	2	0.0112			
			9	7	0.9805	13	3	0.0461			
5	0	0.0313	9	8	0.9980	13	4	0.1334			
5	1	0.1875	9	9	1.0000	13	5	0.2905			
5	2	0.5000				13	6	0.5000			
5	3	0.8125	10	0	0.0010	13	7	0.7095			
5	4	0.9687	10	1	0.0107	13	8	0.8666			
5	5	1.0000	10	2	0.0547	13	9	0.9539			
			10	3	0.1719	13	10	0.9888			
6	0	0.0156	10	4	0.3770	13	11	0.9983			
6	1	0.1094	10	5	0.6230	13	12	0.9999			
6	2	0.3437	10	6	0.8281	13	13	1.0000			
6	3	0.6562	10	7	0.9453						
6	4	0.8906	10	8	0.9893	14	0	0.0001			
6	5	0.9844	10	9	0.9990	14	1	0.0009			
6	6	1.0000	10	10	1.0000	14	2	0.0065			
						14	3	0.0287			
7	0	0.0078	11	0	0.0005	14	4	0.0898			
7	1	0.0625	11	1	0.0059	14	5	0.2120			
7	2	0.2266	11	2	0.0327	14	6	0.3953			
7	3	0.5000	11	3	0.1133	14	7	0.6047			
7	4	0.7734	11	4	0.2744	14	8	0.7880			
7	5	0.9375	11	5	0.5000	14	9	0.9102			
7	6	0.9922	11	6	0.7256	14	10	0.9713			
7	7	1.0000	11	7	0.8867	14	11	0.9935			
			11	8	0.9673	14	12	0.9991			
			11	9	0.9941	14	13	0.9999			
			11	10	0.9995	14	14	1.0000			
			11	11	1.0000						

Table 2.
Sign Test Background Data for Surface Water
Wayne Disposal, Inc. Site No. 2

Parameter	Units	Number of Values	Mean
Arsenic	mg/l	24	0.015
Barium	mg/l	24	0.64
Cadmium	mg/l	24	0.017
Calcium	mg/l	24	304
Chromium (total)	mg/l	24	0.06
Chromium (hexavalent)	mg/l	24	0.009
Iron	mg/l	24	46.4
Magnesium	mg/l	24	66
Manganese	mg/l	24	1.19
Mercury	mg/l	24	0.0007
Selemum	mg/l	24	0.0043
Silver	mg/l	24	0.01
Sodium	mg/l	24	28
Zinc	mg/l	24	0.54
Alkalinity (total)	mg/l	24	187
Alkalinity (bircarbonate)	mg/l	24	187
Alkalinity (carbonate)	mg/l	24	18
Chloride	mg/l	24	54
Nitrate	mg/l	24	0.76
pH	Stnd. Units	24	7.5
Sulfate	mg/l	24	213
Tot. Susp. Solids	mg/l	21	2797

Notes: Background data were complied from eight quarters during period from May 1989 to April 1991

Detection Limits values are used for data which are reported to be below the method detection limit.

Attachment B5.G
SEDIMENTATION BASIN SAMPLING AND ANALYSIS PLAN
WAYNE DISPOSAL, INC., SITE #2 MID 048 090 633

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2.0 REVISION 1
3.0 SAMPLE LOCATIONS 1
4.0 SAMPLE FREQUENCY 2
5.0 SAMPLE COLLECTION 2
6.0 SAMPLE ANALYSIS 3
7.0 DATA EVALUATION 3
8.0 RESPONSE ACTIONS 4
9.0 REPORTING REQUIREMENTS 5
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Attachments

Attachment A Figure 1: Sedimentation Basin Map
Figure 2: South Sedimentation Basin Monitoring Sample Sectors
Figure 3: North Sedimentation Basin Monitoring Sample Sectors
Attachment B Sample Collection Log for Sediments

SEDIMENTATION BASIN SAMPLING AND ANALYSIS PLAN
WAYNE DISPOSAL, INC., SITE #2 MID 048 090 633

1.0 INTRODUCTION

This Sedimentation Basin Sampling and Analysis Plan (SB SAP) identifies the procedures to be used for monitoring sediment samples from the two sedimentation basins at Wayne Disposal, Inc. (WDI) Site 2. The two sedimentation basins are designated as the north sedimentation basin (NSB) and the south sedimentation basin (SSB), and if necessary, the north sedimentation basin extension (NSBE) and the south sedimentation basin expansion (SSBE). These sedimentation basins receive on-site surface water (storm water) run-off primarily from unpaved areas and final cover systems of the facility via a network of open ditches and subsurface pipes. The route of surface water flow in the ditches into the sedimentation basins is shown on Figure 1 of Attachment A. Water collected in the NSB is pumped, on demand, into a ditch system that flows into the SSB. The SSBE provides additional storage prior to the water entering the SSB. The NSBE only receives water when the water level in the NSB reaches a high level and thus acts as overflow protection.

All surface water collected in the sedimentation basins is treated by sedimentation, filtration, and activated carbon adsorption prior to discharge to Quirk Drain. The effluent from this treatment process is discharged into Quirk Drain in accordance with a National Pollutant Discharge Elimination System (NPDES) permit. This monitoring program evaluates engineering controls and operational procedures employed by WDI to detect an on-site release of hazardous waste or hazardous waste constituents as early as possible and allows WDI to initiate efforts to locate and control the source as well as prevent an off-site release.

The monitoring program described in this SB SAP is designed to monitor the chemical quality of the sediments that have accumulated in the bottom of each basin over time. Monitoring the composition of certain parameters within the sediment is done to determine if concentrations are increasing over time, which could indicate that hazardous waste or hazardous waste constituents are present. In addition to describing the monitoring program, the SB SAP prompts notification and response actions that WDI must take if an apparent or confirmed significant increase in a monitored parameter occurs.

2.0 REVISION

WDI may revise this SB SAP and submit the revised plan to the Michigan Environment, Great Lakes, and Energy's (EGLE), Material Management Division (MMD),) for review and approval prior to implementation.

3.0 SAMPLE LOCATIONS

Each sedimentation basin is divided into six sections as shown in Figures 2 and 3 found in Attachment A for the SSB, SSBE, NSB and NSBE, respectively. The NSB and SSB are the primary monitoring locations of this plan. One grab sample is collected at random locations

within each section of the basins during each sampling event. In the event of a confirmed statistical exceedance that could indicate impact to the sediments, the SSBE and the NSBE will also be sampled. Each sampling point is to be located using a GPS or equivalent method and the coordinates listed on the sample log found on Figure 4 included in Attachment B.

4.0 SAMPLE FREQUENCY

The annual sampling event will include the SSB and NSB and should be scheduled in the spring at approximately the same time each year, unless water elevations impede the sampler's ability to collect samples. The SSBE and NSBE will only be sampled in the event of a confirmed statistically significant increase (CSSI) in their respective sedimentation basins.

5.0 SAMPLE COLLECTION

For each basin, a grab sample is to be collected from each section of each basin shown in Figures 2 and 3. In addition, a representative composite sample from each basin is to be created by combining equal portions from each grab sample from the basin. Sufficient volume of sediment must be collected at each grab sample location such that there is adequate volume to: 1) perform the required grab sample analysis, 2) contribute a portion to the composite sample, and 3) have enough left over sample to be used by the laboratory for a confirmation of an apparent statistically significant increase of polychlorinated biphenyls (PCBs), if necessary. Confirmation procedures are specified in Section 8.0 of this document.

The individual grab samples from each section of each basin are to be collected from a small rowboat utilizing a Ponar grab-type sampler or an auger sampler with an extension. The person conducting the sampling will position the boat at one of the sampling locations, lower the sampling device and retrieve a sample from the upper portion of the sediment. The sample will then be removed from the sampler and placed directly into the appropriate container using a clean Teflon hand trowel. The composite sample from each respective basin is to be collected by placing equal volumes of collected sediment from each individual grab sample location within the respective basin into a stainless-steel bowl or disposable foil pan. After equal portions from all grab sample locations from the respective basin have been collected and placed into the bowl/pan, the sediment in the bowl is to be gently mixed to homogenize the sample, and then a portion of the mixed sample is placed into an appropriate container.

Clean protective gloves must be worn during sample collection and a new set of clean gloves must be used at each sample location. Care should be always taken when handling the samples to avoid sample cross-contamination. Each sample container must be labeled with the sampling location, the time and date of the sampling event, and the sampler's initials. The sample collection log (Figure 4) in Attachment B is to be filled out at each sampling location and any unusual conditions (e.g., odors, sheens) encountered are to be noted. In addition, a chain of custody (COC) form is to be filled out for each sampling event. The COC is to be filled out fully for each sample submitted for analysis and each person handling the samples must sign and date the form. When the samples are delivered to the laboratory and the laboratory has signed for their receipt, a copy of the completed COC form is to be retained on site. . After collection, the samples are stored in a clean cooler containing ice or ice packs. The coolers containing samples are to be stored in a secure location, until being transported to the laboratory.

All non-dedicated sampling equipment is to be thoroughly cleaned and decontaminated prior to initial use and between sample locations by scrubbing with a brush and rinsing with de-ionized water to remove all visible soil/sediment material.

Field Quality Assurance/Quality Control samples collected for each sampling event, including confirmation sampling events, include:

- One trip blank for each cooler utilized for storing and shipping PCB samples. The trip blank is to be analyzed for PCBs.
- One blind duplicate for each sampling event. The duplicate sample is to be analyzed for the identical set of parameters as the parent samples. Sediment collected for the duplicate is placed in a clean container and homogenized prior to filling an identical set of sample containers at a given location and submitting them for an identical analysis.
- One equipment blank per sampling day for each piece of non-dedicated sampling equipment utilized in the sampling process (i.e., sample collection tool/ponar and/or composite sample collection bowl/foil pan). The equipment blanks are to be collected by pouring clean de-ionized water over the decontaminated pieces of equipment and collecting the rinsate in the appropriate container for analysis. The equipment blanks are to be analyzed for the identical set of parameters as the sediment samples.

6.0 SAMPLE ANALYSIS

Each grab sample is to be analyzed for the parameters listed in Table 1 identified as grab sample parameters. The analytical methods and method detection limits specified are also listed on Table 1. Each composite sample from each basin is to be analyzed for all the PCB aroclors listed on Table 1 using the analytical methods and method detection limits specified. In addition, all grab samples must also be extracted for PCB analyses but only analyzed, if necessary, as confirmation samples per Section 8.0. In some cases, the laboratory may not attain the reporting limits specified due to sample dilutions and matrix effects. If this is the case, the laboratory report must include an explanation for not achieving the specified method detection limits.

The laboratory quality assurance/quality control manual (QA/QC Manual) describing the required internal policies, guidelines, and procedures of any WDI contract lab is contained in the Groundwater Sampling and Analysis Plan (GW SAP). WDI is to use this QA/QC Manual in evaluating the QA/QC standard operating procedures of any contract laboratory utilized for the purposes of this SB SAP and ensure that the laboratory employs generally acceptable practices that meet the specifications of the QA/QC Manual in the GW SAP.

7.0 DATA EVALUATION

The analytical data from the sedimentation basin samples is to be evaluated as follows:

- For a PCB composite sample, an apparent statistically significant increase (ASSI) has occurred if the total concentration of the PCB compounds listed in Table 1 is greater than or equal to 1 mg/kg on a dry-weight basis.
- For metals, phenols, and total and amenable cyanide, the data will be evaluated using graphical trend analysis. An ASSI for any parameter has occurred if increasing concentrations are noted for any individual parameter in four consecutive sampling

events and/or a ten-fold increase in concentration is noted in any parameter between sampling events in any of the individual grab samples. If four consecutive samples show increasing concentrations, WDI must determine the difference between the first and fourth sample concentrations and determine if this quantity is greater than 10 percent of the mean of the concentration of those four measurements for that parameter. If an increasing trend is noted and the difference between the first and fourth of the four most recent samples is greater than 10 percent of the mean, then an ASSI is reported. If the difference is less than 10 percent of the mean, then no ASSI will be reported.

8.0 RESPONSE ACTIONS

In the event of an ASSI, WDI is to verbally notify MMD staff immediately, give them an opportunity to split confirmation samples, and implement the procedures identified below to confirm the ASSI. Confirmation samples must be collected and submitted for analysis within 7 days of providing notification of an ASSI, unless water levels prevent sampling.

- For the composite PCB samples, procedures to determine if a CSSI has occurred are as follows. The additional grab samples collected in each section of the basin that were sent to the lab and extracted are to be analyzed for PCBs. If any of the grab samples for which PCBs are detected are above the action level defined in Section 7.0 (i.e., the ASSI is repeated), then a CSSI will have been confirmed for that section of the basin that the grab sample represented.
- For the metals, total and amenable cyanide, and phenols grab samples, procedures to determine if a CSSI has occurred are as follows. Any section of the basins for which an ASSI is reported for metals, total and amenable cyanide, and/or phenols is to be resampled by collecting four additional samples within the section of the basin that caused the ASSI. If the concentrations in two of the four confirmation samples are equal to or greater than the original sample, then the increase is a CSSI.

In the event an ASSI is not repeated, WDI will resume routine monitoring. In the event an ASSI is repeated, it is considered a CSSI. After a CSSI has occurred, WDI must notify MMD in accordance with the General Operating Conditions of the Operating License for reporting noncompliance that may endanger human health or the environment. Further, within 30 days of becoming aware of a CSSI, WDI must implement the following actions depending upon the CSSI parameter and the CSSI location:

- Collect samples from the respective sedimentation basin extension experiencing the CSSI as specified by Section 5.0, unless water levels prevent sampling.
- If the CSSI is for metals, phenolics, total cyanide, or amenable cyanide, submit a work plan for MMD review and approval to delineate the extent of contamination in the basin, identify and eliminate the source of the contamination, and determine if concentrations are sufficiently elevated to require removal of sediments from the impacted basin.
- For a PCB CSSI, submit a work plan to delineate and/or remove sediments from the impacted basin for the MMD review and approval.

WDI may voluntarily remove sediments from any sedimentation basin without MMD approval if WDI verbally notifies MMD staff of the removal at least five days in advance of the removal and

performs the removal in compliance with all applicable laws. In the event WDI chooses to voluntarily remove sediments from either basin in response to an ASSI or CSSI, all source investigation and removal requirements defined above shall still be implemented. WDI may also remove sediments if accumulation of sediment has or will soon reduce the basin capacity below the required capacity. The required capacity and method for measuring capacity reduction is included in the Stormwater Management Program SOP. If the removal is completed due to reduced capacity of the basin, MMD staff will be notified prior to the removal.

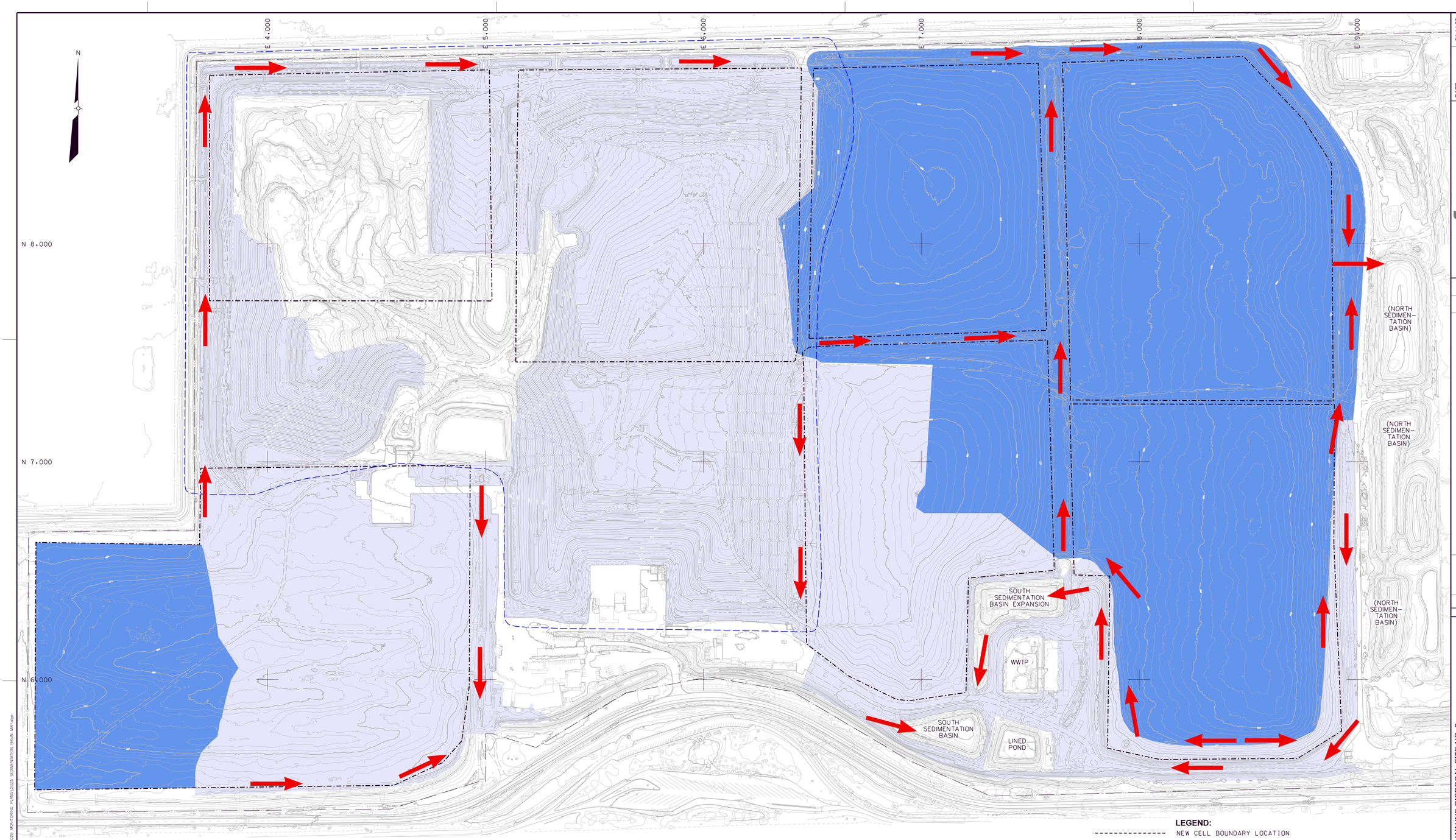
9.0 REPORTING REQUIREMENTS

A final SB SAP Report (Report) documenting the annual sampling under this plan, including the data received from the laboratory, is to be submitted to the MMD within 60 days of each sampling event. All Reports must include a narrative description of the sampling event, a map of each respective basin showing each location sampled, copies of the sampling logs, a tabular summary and discussion of the data, the trend analysis calculations, discussion of the trend analysis results, a description of any ASSI and/or CSSI, as applicable, and description of any resampling conducted and/or any additional actions required and/or recommended because of the Report findings. In addition to the final SB SAP Report, an annual summary report of sedimentation basin monitoring results must be submitted to MMD by March 1 of the following year.

10.0 RECORD KEEPING REQUIREMENTS

All analytical data and Reports generated under this SB SAP must be stored on site within the facility filing system and be available to EGLE staff for inspection.

Attachment A: Sedimentation Basin Figures



NOTES:

1. AERIAL TOPOGRAPHY BY DRONEVIEW TECHNOLOGIES
   DATE OF AERIAL: FEBRUARY 03, 2025.
   UPDATED WITH FLYOVER FROM MARCH 31, 2025.

LEGEND:

- NEW CELL BOUNDARY LOCATION
- OLD CELL BOUNDARY LOCATION
- PROPERTY LINE LOCATION
- EXISTING CONTOUR (2 FT INTERVAL)
- EXISTING STRUCTURE / BUILDING
- EXISTING ROAD (PAVED / GRAVEL)
- GRID COORDINATES
- DIRECTION OF SURFACE WATER FLOW
- AREA A
- AREA B

SCALE 0' 100' 200' 400'

CTI and Associates, Inc.
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Farmington Hills, Michigan 48331
248.488.5100 (fax)248.488.5050
www.ctiompanies.com

DATE:	04-14-25
DESIGNED BY:	RB
DRAWN BY:	BDA
CHECKED BY:	RB
APPROVED BY:	XZ

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REV	DATE	REVISION DESCRIPTION	DRN	APP

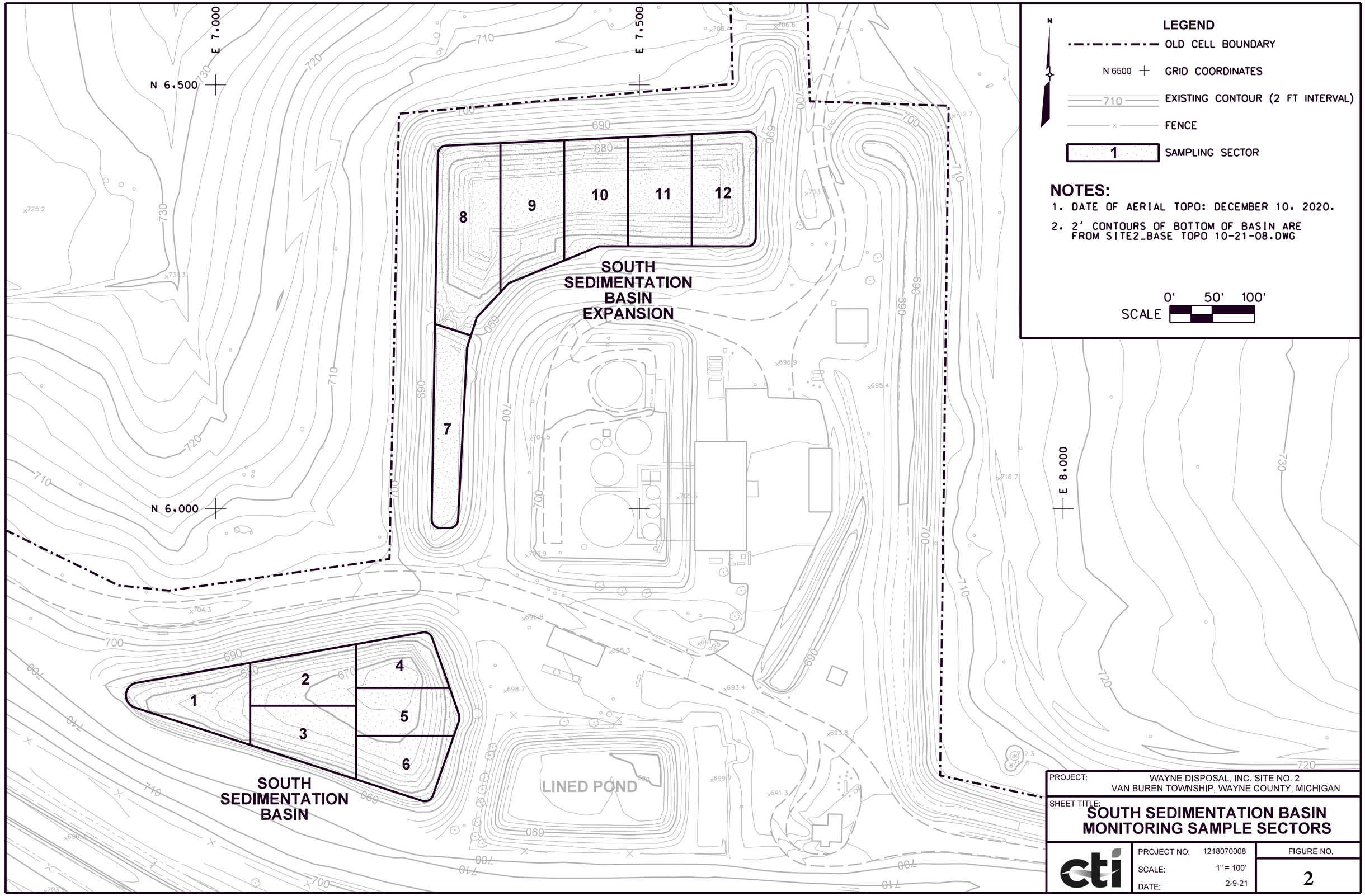
WAYNE DISPOSAL SITE NO. 2
WAYNE, MICHIGAN

SEDIMENTATION BASIN MAP

PROJECT NUMBER 23L023
SCALE 1" = 200'
DRAWING NO **01**

TIME PLOTTED: 5:23:36 PM
DATE PLOTTED: 4/14/2025
FILENAME: C:\Shared\Box\Commercial\US Ecology\WDI\CAD\Site\Monitoring Plans\2025 MONITORING PLANS\2025 SEDIMENTATION BASIN MAP.dgn

DRAWING SIZE: 24" X 36"



PROJECT: WAYNE DISPOSAL, INC. SITE NO. 2
VAN BUREN TOWNSHIP, WAYNE COUNTY, MICHIGAN

SHEET TITLE:
SOUTH SEDIMENTATION BASIN MONITORING SAMPLE SECTORS

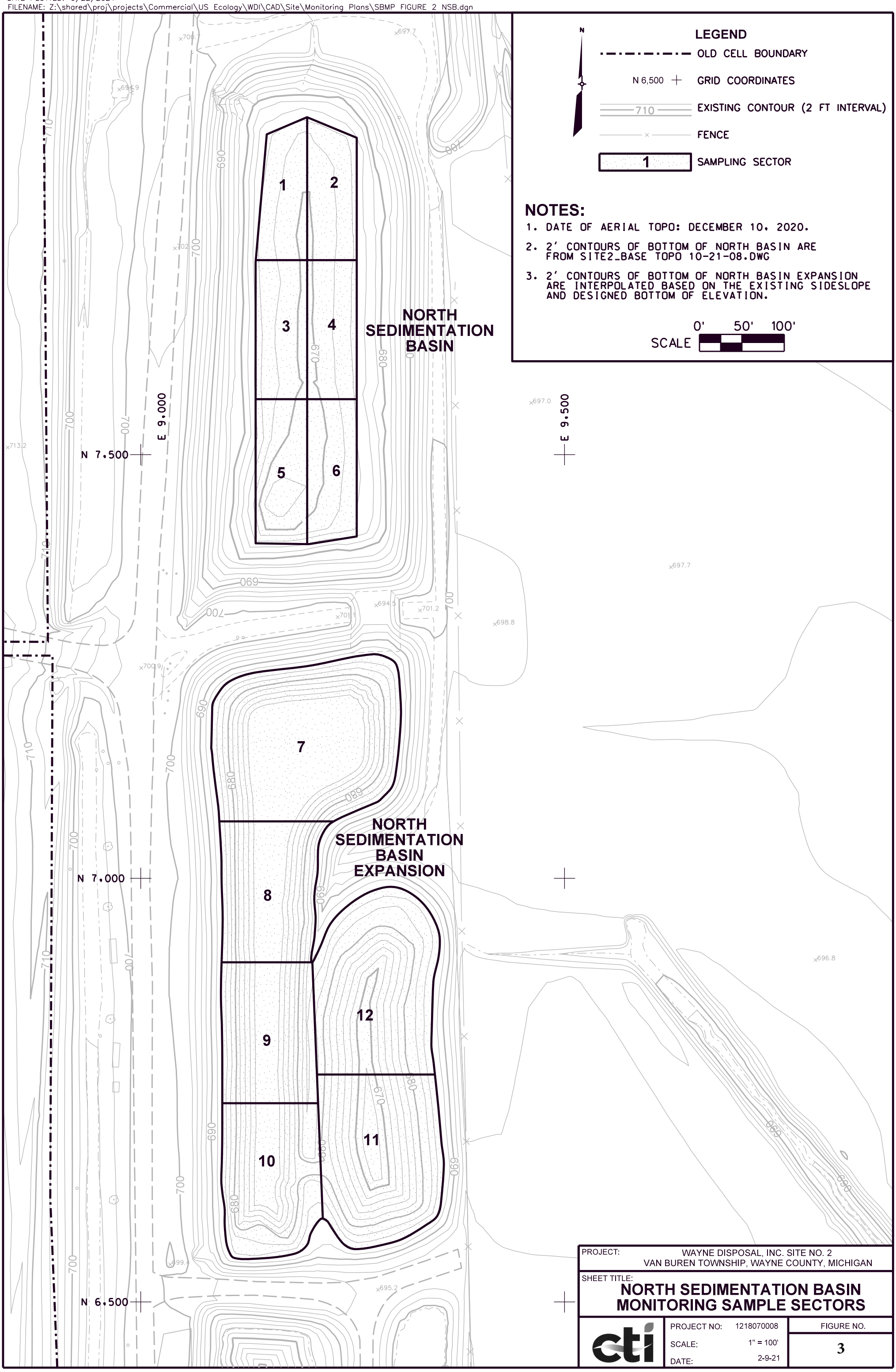
cti	PROJECT NO: 1218070008	FIGURE NO.
	SCALE: 1" = 100'	2
	DATE: 2-9-21	

TIME PLOTTED: 10:28:16 AM
DATE PLOTTED: 9/22/2021
FILENAME: Z:\shared\proj\projects\Commercial\US Ecology\WDI\CAD\Site\Monitoring Plans\SBMP FIGURE 1 SSB.dgn

DRAWING SIZE: 11"x17"

TIME PLOTTED: 10:28:45 AM
DATE PLOTTED: 9/22/2021
FILENAME: Z:\shared\proj\projects\Commercial\US Ecology\WDI\CAD\Site\Monitoring Plans\SBMP FIGURE 2 NSB.dgn

DRAWING SIZE: 11"x17"



PROJECT: WAYNE DISPOSAL, INC. SITE NO. 2
VAN BUREN TOWNSHIP, WAYNE COUNTY, MICHIGAN

SHEET TITLE:
NORTH SEDIMENTATION BASIN MONITORING SAMPLE SECTORS

cti

PROJECT NO: 1218070008
SCALE: 1" = 100'
DATE: 2-9-21

FIGURE NO.
3

Attachment B: Sample Log

Figure 4. Sample Collection Log for Sediments - WDI Site #2

Sample ID: (Basin, Sector #)	**Sample Date:**	**Sample Time:**
Sample Location: (x,y coordinates)	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		

Sample ID: (Basin, Sector #)	**Sample Date:**	**Sample Time:**
Sample Location: (x,y coordinates)	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		

Sample ID: (Basin, Sector #)	**Sample Date:**	**Sample Time:**
Sample Location: (x,y coordinates)	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		

Sample ID: (Basin, Sector #)	**Sample Date:**	**Sample Time:**
Sample Location: (x,y coordinates)	**Sampling Method:**	**Sampler:**
Sample Description/Comments*:		

□ n□ud□ □n□unusu□□□h□r□□t□r□st□s su□h □s □□□r□sh□□n□□d□r□□t□□

Attachment C: Table 1 Sample Parameters

Table 1. Sedimentation Basin monitoring Parameters

Grab Sample Parameters	RL[1] (mg/Kg)[2]	Approved Method[3]
Arsenic	0.5	6020A
Barium	1	6020A
Cadmium	0.2	6020A
Chromium (total)	2	6020A
Cobalt	0.5	6010C
Copper	1	6020A
Iron	5	6010C
Lead	1	6010/6020
Mercury	0.05	7471B
Molybdenum	1	6010C
Nickel	1	6010C
Selenium	0.2	6020A
Silver	0.1	6020A
Vanadium	1	6020A
Zinc	1	6020A
Total Phenolics	0.4	9065
Total Cyanide	0.1	9014
Amenable Cyanide	NA	9014
Composite Sample Parameters		
PCB-1016	0.1	8082A
PCB-1221	0.1	8082A
PCB-1232	0.1	8082A
PCB-1242	0.1	8082A
PCB-1248	0.1	8082A
PCB-1254	0.1	8082A
PCB-1260	0.1	8082A

1 - Target Reporting Limits from OWMRP-111/115-8
2 - Dry Weight Basis
3 - Test Methods For Evaluating Solid Waste, USEPA SW-846

Attachment B5.H

LEACHATE MONITORING SAMPLING & ANALYSIS PLAN

WAYNE DISPOSAL, INC. SITE #2
MID 048 090 633

SAMPLING AND ANALYSIS PLAN FOR THE MONITORING OF LEACHATE AND LEACHATE LEVELS

WAYNE DISPOSAL, INC. SITE #2
MID 048 090 633

1.0 INTRODUCTION

The purpose of this document is to outline the procedures for monitoring leachate in compliance with current license and permit conditions and applicable regulations. Leachate monitoring includes the collection and analysis of leachate samples and monitoring leachate levels for the purpose of ensuring that leachate is effectively removed from operating and closed hazardous waste landfill cells. There are currently twenty-one operating leachate sumps within the hazardous waste management area. The locations of the twenty-one operating sumps, and the locations of five additional sumps for future landfill cells are shown on Figure 1.

Collection and analysis of leachate samples is conducted in order to characterize the leachate for the purpose of developing or amending appropriate monitoring parameter lists for other monitoring programs such as groundwater and leak detection. The composition of the leachate over time may change during the operation of a landfill cell.

Leachate level monitoring is necessary to ensure that leachate collection systems are functioning properly so as to limit the leachate head on the liner system. CFR 40 264.301(2) states that "The Regional Administrator will specify design and operating conditions in the permit to ensure that the leachate depth over the liner does not exceed 30 cm (1 foot)". Wayne Disposal, Inc. Site #2 monitors the volume of leachate pumped from each active and closed cell at the facility. The volume of leachate pumped from each cell per month is recorded in the operating log. The following sampling and analysis plan (SAP) describes how WDI maintains compliance with the requirements outlined above.

2.0 DESCRIPTION OF LEACHATE COLLECTION SYSTEMS

Leachate level control is a function of the design and operation of the leachate collection systems (LCS). Each LCS at WDI is designed to transmit leachate to the sump at rates sufficient to permit removal of leachate so that levels do not build up on the lowest part of the primary liner outside the sump to a depth greater than one foot. The slope of the cell floor, permeability of granular materials, and the size and spacing of collector pipes are all taken into consideration in the design transmissivity of the LCS.

Once the leachate is conveyed to the collection sump, it must be removed at a rate sufficient to prevent leachate from backing up into the collection system to levels higher than one foot above the lowest elevation of the primary liner (the compliance elevation) , which is the liner elevation just outside of the sump. Each cell has a measured compliance elevation that is used to determine

if the levels are in compliance. The pumps are set at a depth within each sump that is beneath the level where the leachate conveyance pipes enter the sump (see Figure 2). These 4" or 6" diameter HDPE pipes are situated directly on top of the liner in the sump. The pumps are set to run automatically by either a timer system or a level sensor system. On the sumps with a timer system, the pump runs until the sump is dry and then turns off; it restarts after a programmed time delay to allow enough leachate to accumulate in the sump for the pump to restart. The timed delay is adjusted as the leachate accumulation rate changes to keep the leachate head in compliance without over-using the pump. A level sensor does the same thing but uses a transducer to monitor the leachate level in the sump to trigger the pump to activate. As long as the pumps keep the leachate levels in the sump below the compliance elevation, then compliance with the “one-foot head rule” is maintained. Therefore, the key to compliance is maintaining an operating collection system in each cell. Frequent inspection and swift repairs of these systems are necessary to ensure that any mechanical problems are remedied in a timely manner.

The volume of leachate pumped out of each sump is recorded on a totalizing flow meter which is placed in line in the discharge line from the pump. Leachate is conveyed to the wastewater pretreatment plant on site.

3.0 LEACHATE LEVEL AND VOLUME MEASUREMENTS

The keys to maintaining compliance with leachate level and volume record keeping requirements are frequency of inspection and maintenance of each system. To ensure proper performance of the leachate collection system, weekly inspections of the sump areas must be conducted. Figure 3 is a checklist form for recording the results of this weekly inspection. The main components of this inspection are determining leachate levels in the sump, whether the pump/meter is operating correctly and the monthly volume of leachate. An outline of these procedures in the form of a flow chart is included on Figure 4. The procedures for the weekly inspection are as follows:

Step #1. PUMP/METER FUNCTION

a. Take meter reading from flowmeter and record on form. If the meter has moved since the last reading then proceed to Step 2. If not, then proceed to step 1.b.
b. Change pump switch to "hand" position, listen for the sound of the pump turning on and check for meter advancement. Then change pump switch back to "auto" position.
c. If the meter moves then proceed to step 2.
d. If meter does not move then:

    i. Determine if it is likely that the pump intake above the leachate level in sump. This can be done by visual inspection (can you see the pump above the leachate), by sound (the pump makes a distinctive noise when trying to draw in air), or by measuring the leachate head elevation. If the leachate level is below the sump intake, then the inspection is complete and the results should be noted on the form.
    ii. If the pump intake is below the leachate level then further investigation is necessary. Record the apparent malfunction on the inspection form and report

results to the Site Manager or Environmental Manager and proceed with steps 2 and 3.

Step #2. LEVEL MEASUREMENT

a. Measure the leachate level in the sump from the top of the sump with an electronic water level sensor device.

b. Compare the elevation to leachate with the ”Compliance Depth to Leachate” listed on Figure 3. Determine whether the level is in compliance.

c. Record the result on the weekly inspection form.

d. Notify the Site or Environmental Manager immediately if the levels are found to be above the allowable level.

Step #3. REPAIRS

a. Unless a specific problem is evident from the inspection (e.g., the pump doesn't turn on), the following steps should be conducted:

   i. Remove the meter, switch back to "hand" position, and check for flow.

   ii. If there is flow, then field clean the meter, replace, and check for meter advancement. If the meter advances, then switch back to “auto" position. If not, take the meter in for repair or replacement.

   iii. If there is no flow, then disconnect power to pump and remove pump and pump switch from the sump. Inspect the electrical cord and the pump switch. Replace the pump and test functions. If the pump or the switch still doesn't work, remove the pump, have it power washed and get it repaired/replaced.

   iv. If the pump and meter are functional but no flow is observed then arrangements must be made to clean out the pipes.

   v. All actions taken, and any repairs/replacements conducted must be reported to the Site Environmental Manager.

Every effort should be made to keep or restore leachate level compliance while maintenance or repairs are conducted. Spare parts and spare pumps should be kept in stock on site to minimize down time. In the event that leachate levels exceed compliance elevations due to equipment failure, the leachate level should be measured to determine when the levels return to compliance after repairs are completed.

The weekly inspection checklist forms are to be kept on file at the site. Any conditions noted that would require maintenance or repair should be noted on the weekly inspection form (Figure 3) and reported to the Landfill Manager. Any repairs required on the sump or pump that is necessary to keep leachate levels in compliance must be given the highest priority.

On a monthly basis, the total volume recorded on the flow meters from each sump is summarized from the Weekly Inspection Checklist for Leachate Collection Systems onto an electronic spread sheet.

In addition to these inspections, periodic maintenance of the LCS is required. In particular, leachate clean-out pipes, where present, must be jetted once every two years unless experience indicates that a more or less frequent jetting program is necessary or adequate. The results of the jetting program are submitted to EGLE with the annual Operation and Maintenance Report.

4.0 LEACHATE SAMPLING AND ANALYSIS

Leachate samples are to be collected annually from each of the twenty-one currently operational collection sumps within Master Cells V, VI and VII as shown on Figure 1. When the additional phases of cells VI-G or VI-F are constructed and put into operation, the additional sumps must be sampled in accordance with this plan as well. The samples are collected during the third quarter of each year. Samples are collected by either 1) lowering a clean stainless-steel sampling bucket vessel down into the sump and retrieving a sample, or 2) where valves are present at the top of the riser pipe, collecting the samples directly into the sample containers. If used, the stainless-steel vessel must be decontaminated between each sample location with cleaning solution and a distilled water rinse.

If the sample is collected in the stainless-steel vessel, it must be carefully decanted into appropriate sampling containers. Samples for VOCs are collected first while ensuring that no headspace is present within the sampling vials. Additional samples are then collected in order of decreasing volatility, semi-volatiles, then total organic carbon, then phenolics, and finally metals and indicator parameters. Appropriate sample handling and container requirements are summarized on Figure 5. Metals are analyzed as "total metals" quantity; no filtration is required.

Protective gloves must be worn during sample collection and care should be taken to prevent spills on skin or clothing. Each sample container must be carefully labeled with the sampling location, time and date, identity of preservatives contained within, and the sampler's initials. After collection, the samples shall be stored in a clean cooler containing ice or ice packs. The coolers containing samples must be stored in a secure location, on-site, until they are transported to the laboratory.

Field Quality Assurance/Quality Control samples must include:

- One trip blank for every ten samples collected. The trip blank must be stored in the cooler utilized for storing and shipping samples. The trip blank must be analyzed for VOCs.

- One field blank for each ten samples collected. The field blank samples are to be collected by filling an identical set of sample bottles at a given location with clean deionized water. The field blank samples must be analyzed for VOCs.
- One blind duplicate for each sampling event. The duplicate must be collected by filling an identical set of sample bottles at a given location and submitting them for an identical analysis.
- One equipment blank per sampling day for each piece of non-dedicated sampling equipment utilized in the sampling process (i.e. the stainless-steel vessel). The equipment blank must be collected by pouring clean deionized water into the decontaminated piece of equipment and collecting the rinsate in the appropriate jar for analysis. The equipment blank must be analyzed for VOCs.

A sample collection log (Figure 6) must be filled out at each sampling location. The log must be filled out to include the location, date, time, identity of sampler, and a description of any unusual conditions encountered must be noted. A chain of custody form must be filled out for each sampling event. This form must be filled out fully for each sample submitted for analysis and each person responsible for the handling of these samples must sign and date the form. When the samples are delivered to the laboratory and the lab has signed for their receipt, a copy of this form must be retained on site.

Except as described below, each sample must be analyzed for the parameters listed on Figure 7, which also contains the analytical methods and targeted method detection limits. The detection limits listed on Table 7 (and Table 8) must be consistent with EGLE Policy and Procedures document OWMRP-111/115-8 or approved by EGLE and may need to be revised as analytical methods change. Exceptions to the parameter lists are as follows: 1) The polychlorinated biphenyls (PCBs) listed on Figure 5 are only analyzed in samples from Master Cell (MC) VI, and 2) In order to fully characterize the leachate, each of the leachate sumps in MC V, MC VI and MC VII must be analyzed for a modified list of 40 CFR 264 Appendix IX parameters on a rotating basis. The list is considered "modified" as dioxins and furans are analyzed at screening levels as opposed to a breakdown of the specific congeners. Analysis of the congeners requires the use of a specialty laboratory and the ultra-low detection limits have no practical use in this leachate characterization. Each year, enough of the leachate samples must be analyzed for the modified list of Appendix IX parameters such that all sumps are analyzed for Appendix IX parameters within a five year time period. For instance, with twenty-one sumps four samples per year would be analyzed for Appendix IX each year for the first four years and the remaining five sumps in year five. New cells will not be analyzed for the Appendix IX constituents until they have been producing leachate for at least one year and then will be added to the rotation as described above. A list of Appendix IX parameters along with corresponding analytical methods and detection limits are presented on Figure 8. It is recognized that in most cases the detection limits shown on Figures 7 and 8 will not be attained due to sample dilutions and matrix effects.

5.0 REPORTING REQUIREMENTS

Within 60 days after each sampling event is completed, the analytical results must be submitted to EGLE along with a summary of QA/QC data and the sampling documentation forms. In addition to the reporting requirements described above, an annual leachate report must be filed

with the EGLE by March 1 of the following year. In this report, annual leachate production rates, leachate head levels, and leachate analytical results are to be evaluated and summarized. This summary must also include a description of any non-compliances and associated corrective actions and of any major maintenance or repair activities. The leachate analytical data must be evaluated with respect to the need to refine secondary collection and groundwater monitoring programs by summarizing, in table form, the rate of detection and concentration of leachate monitoring parameters. The results of this summary will be compared to groundwater and leak detection parameter lists. Any parameter that is found in more than 50% of the leachate samples and/or in concentrations greater than 1 milligram per liter will be considered for inclusion in the leak detection and/or groundwater monitoring program(s). WDI will recommend whether to include such a parameter based on its chemical properties and any other relevant information.

Leachate volume and head level information must be evaluated in graphical and/or tabular form, respectively. Monthly and annual volumes for each cell must be plotted to determine if there are increases in production rates that should be evaluated. The head levels must be presented to show the dates and results of head measurements and identify any periods where heads exceed the one foot head level as well as the duration of the exceedance and the cause and correction of the exceedance. Head level exceedances must be reported per license requirements and monthly volumes summarized in the annual report due March 1st for the previous year.

E 4.000 E 5.000 E 6.000 E 7.000 E 8.000 E 9.000

N 8.000 N 7.000 N 6.000

V-A V-B V-E V-C VII-A VII-B VII-C

VI-F3 VI-F4 VI-F2 VI-F1 VI-G4 VI-G5 VI-G6 VI-G7

VI-E-NE VI-E-NW VI-E-SW VI-E-SE VII-BS

VI-B VI-A NORTH VI-A SOUTH VI-C VI-D

MC VI-F2 MC 4 MC VI-F3 MC VI-F4 MC6EP2-NE MC 5 MC 7 MC 9

MC VI-F1 MC6EP2-W MC6EP2-SE

MC VI-G2 MC VI-G3 MC6EP1-SW MC VI-G1-EP2

VI-G1 MC VI-G1 MC VI-G1-EP1 MC6 B MC6 A-N MC 11

MC VI-G4 MC6 D MC6 C MC6 A-S

MC VI-G6 MC VI-G7 MC VI-G5 MC 10

MC 1

NOTES:

1. AERIAL TOPOGRAPHY BY DRONEVIEW TECHNOLOGIES
   DATE OF AERIAL: DECEMBER 08, 2023.

SCALE 0' 100' 200' 400'

REV02

LEGEND:

- EXISTING LEACHATE COLLECTION SUMP
- PROPOSED LEACHATE COLLECTION SUMP
- EXISTING LEACHATE DETECTION SUMP RISER
- PROPOSED LEACHATE DETECTION SUMP RISER
- NEW CELL BOUNDARY LOCATION
- OLD CELL BOUNDARY LOCATION
- PROPERTY LINE LOCATION
- EXISTING CONTOUR (2 FT INTERVAL)
- EXISTING STRUCTURE / BUILDING
- EXISTING ROAD (PAVED / GRAVEL)
- GRID COORDINATES
- REVISION NUMBER

	DATE:	2-9-21
	DESIGNED BY:	XZ
	DRAWN BY:	BDA
	CHECKED BY:	HS
	APPROVED BY:	XZ

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REVISIONS			
REV	DATE	DRN	APP
02	04-30-24	BA	XZ
01	10-28-22	BA	XZ

WAYNE DISPOSAL SITE NO. 2
WAYNE, MICHIGAN

LEACHATE COLLECTION AND LEAK DETECTION LOCATIONS

PROJECT NUMBER 1218070066

SCALE 1" = 200'

DRAWING NO 4

TIME PLOTTED: 3:15:51 PM
DATE PLOTTED: 4/30/2024
FILENAME: C:\Shared\Gis\Commercial\US Ecology\WDV\CAD\Site\Monitoring Plans\LEACHATE COLLECTION AND LEAK DETECTION LOCATIONS REV02.dgn

DRAWING SIZE: 24" X 36"

SCHEMATIC OF LEACHATE COLLECTION SUMP ARRANGEMENT
WAYNE DISPOSAL SITE #2 HAZARDOUS WASTE LANDFILL

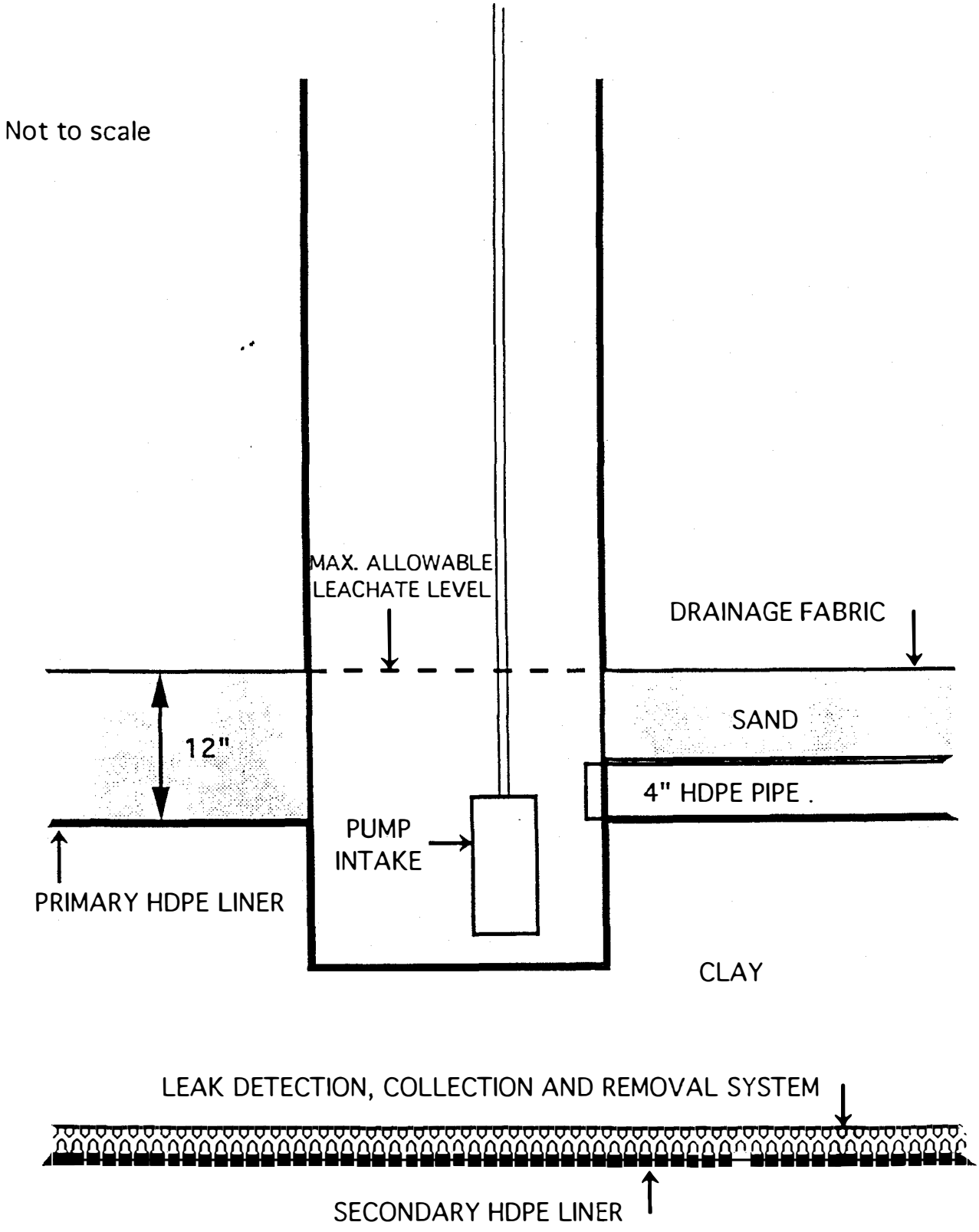


Figure 2

WEEKLY INSPECTION CHECKLIST FOR LEACHATE COLLECTION SYSTEM
WAYNE DISPOSAL, INC. SITE #2 HAZARDOUS WASTE LANDFILL MASTER CELLS

Inspector: _____ **Date:** _____

Cell	Meter Reading	Meter Advance?		Compliance Depth to Leachate (ft)	Actual Depth to Leachate (ft)	Level in Complaince?		Pump Functioning?		Meter Functioning?	
		Y	N			Y	N	Y	N	Y	N
□□□S				□□□□□							
□□□□				□□□□□							
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□□D				□□□□□							
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□□□S□				□□□□□							
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□□□□□				□□4□□							
□□□				□□□□□							

Note: Report items needing immediate attention to the Site Manager

Leachate and Contact Water Collection Systems	Yes	No
□□□□h□t□ □□□□□t□n su□ p r□s□r □□□□rs pr□s□nt □nd pr□p□r□□s□□t□d □□□pp□□□□□□□		
□□nd□t□□n □□□□□□h□t□ □□□□□t□n su□ p r□s□rs □□□□pt□□□□		
□□□□h□t□ d□pths □n □□□h □□□□□t□n su□ p □n □□□□ p□□n□□□		
Pu□ps □un□t□□n□ pr□p□r□□□		
□□nd□t□□n □□□□□□ □ □t□rs □□□□pt□□□□		
S□□□nd□r□ □□nt□n□ □nt □ □n□t□r□n□ su□ps □□r □□□h□t□ □nd □□nt□□t □□t□r □□r□ □ □□ns r□□ □□□□u□d□		

Comments/Action Taken _____

_____

_____

_____

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Leachate and Contact Water Collection Systems

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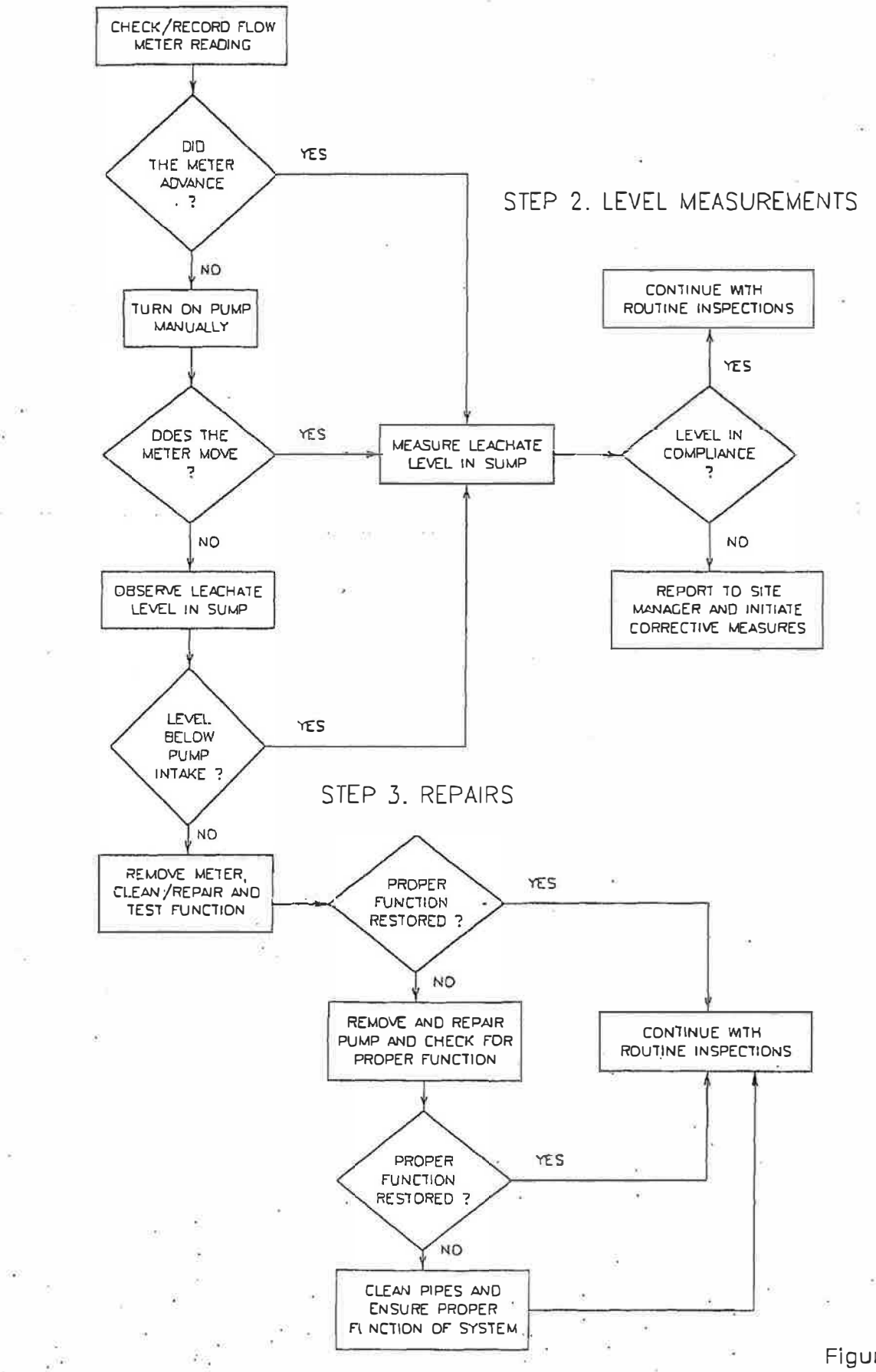

STEP 1. PUMP/METER FUNCTION
CHECK/RECORD FLOW METER READING
DID THE METER ADVANCE . ?
YES
NO
TURN ON PUMP MANUALLY
DOES THE METER MOVE ?
YES
NO
OBSERVE LEACHATE LEVEL IN SUMP
LEVEL BELOW PUMP INTAKE ?
YES
NO
REMOVE METER, CLEAN/REPAIR AND TEST FUNCTION
PROPER FUNCTION RESTORED ?
YES
NO
REMOVE AND REPAIR PUMP AND CHECK FOR PROPER FUNCTION
PROPER FUNCTION RESTORED ?
YES
NO
CLEAN PIPES AND ENSURE PROPER FUNCTION OF SYSTEM
STEP 2. LEVEL MEASUREMENTS
MEASURE LEACHATE LEVEL IN SUMP
LEVEL IN COMPLIANCE ?
YES
NO
CONTINUE WITH ROUTINE INSPECTIONS
REPORT TO SITE MANAGER AND INITIATE CORRECTIVE MEASURES
STEP 3. REPAIRS
CONTINUE WITH ROUTINE INSPECTIONS

Figure 4

Parameter	Perservation	Holding Time	Bottle Type	Minimum Volume
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Th□□□u□	□□□	□M□s	P□□st□□	□□□□ □ □□□
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Figure 6. Sample Collection Log for Leachate - WDI Site #2

Sample ID:	Sample Date:	Sample Time:
Sample Location:	Sampling Method:	Sampler:
Observations/Comments*:		

Sample ID:	Sample Date:	Sample Time:
Sample Location:	Sampling Method:	Sampler:
Observations/Comments*:		

Sample ID:	Sample Date:	Sample Time:
Sample Location:	Sampling Method:	Sampler:
Observations/Comments*:		

Sample ID:	Sample Date:	Sample Time:
Sample Location:	Sampling Method:	Sampler:
Observations/Comments*:		

Sample ID:	Sample Date:	Sample Time:
Sample Location:	Sampling Method:	Sampler:
Observations/Comments*:		

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FIGURE 7. ORGANIC COMPOUNDS FOR LEACHATE MONITORING

VOLATILE ORGANIC PARAMETERS (8260)	MDL (mg/L)	SEMI-VOLATILE ORGANIC PARMETERS (8270)	MDL		MDL
Acetone	0.020	Acenapthene	0.001	Hexachlorobenzene	0.001
Bromodichloromethane	0.001	Acenapthylene	0.001	Hexachlorobutadiene	0.001
Bromoform	0.001	Anthracene	0.001	Hexachlorocyclopentadiene	0.010
Bromomethane	0.005	Benzidene	0.080	Hexachloroethane	0.001
Carbon Tetrachloride	0.001	Benzo(a)anthracene	0.001	Indeno (1,2,3-cd) pyrene	0.002
Chlorobenzene	0.001	Benzo(b)fluoranthene	0.001	Isophorone	0.001
Chloroethane	0.005	Benzo(k)fluoranthene	0.001	2-Methylnapthalene	0.005
2-Chloroethylvinyl Ether	0.010	Benzo(ghi)perylene	0.001	Napthalene	0.001
Chloroform	0.005	Benzoic Acid	0.050	2-Nitroaniline	0.020
Chloromethane	0.005	Benzo(a)pyrene	0.001	3-Nitoraniline	0.020
Dibromodifluoromethane	0.001	Benzyl alcohol	0.050	4-Nitroaniline	0.020
1,2 Dichlorobenzene	0.001	Bis (2-chloroethoxy) methane	0.002	Nitrobenzene	0.002
1,3 Dichlorobenzene	0.001	Bis (2-chloroethyl) ether	0.001	N-Nitrosodiphenylamine	0.002
1,4 Dichlorobenzene	0.001	Bis (2)chloroisopropyl) ether	0.001	N-Nitroso-di-n-propylamine	0.002
Dichlorodifluoromethane	0.001	Bis (2-ethylhexyl) phthalate	0.005	Phenanathrene	0.001
1,1-Dichloroethane	0.001	4-Bromo phenyl ether	0.002	Pyrene	0.001
1,2-Dichloroethane	0.001	Butyl benzyl phthalate	0.005	1,2,4-Trichlorobenzene	0.002
1,1-Dichloroethene	0.001	4-Chloroaniline	0.010	4-Chloro-3-methylphenol	0.005
1,2-Dichloroethene	0.001	2-chloronapthene	0.002	2-Chlorophenol	0.010
1,2 Dichloropropane	0.001	4-Chlorophenyl phenyl ether	0.001	2,4-Dichlorophenol	0.010
1,3 Dichloropropene	0.001	Chrysene	0.001	2,4-Dimethylphenol	0.005
1,1,2,2 Tetrachloroethane	0.001	Dibenz (a,h) anthracene	0.002	4,6-Dinitro-2-methylphenol	0.050
Tetrachloroethane	0.001	Dibenzofuran	0.004	2,4-Dinitrophenol	0.025
Tetrachloroethene	0.001	Di-n-butyl phthalate	0.005	2-Methylphenol	0.010
1,1,2-Trichloroethane	0.001	1,2-Dichlorobenzene	0.001	3-Methylphenol	0.010
1,1,1-Trichloroethane	0.001	1,3-Dichlorobenzene	0.001	4-Methylphenol	0.010
Trichloroethene	0.001	1,4-Dichlorobenzene	0.001	2-Nitrophenol	0.005
Trichlorofluoromethane	0.001	3,3'-Dichlorobenzene	0.020	4-Nitrophenol	0.025
Vinyl Chloride	0.001	Diethyl pthalate	0.005	Pentachlorophenol	0.020
Methylene Chloride	0.005	Dimethyl pthalate	0.005	Phenol	0.005
Methyl Ethyl Ketone	0.005	2,4-Dinitrotoluene	0.005	2,4,5-Trichlorophenol	0.005
Benzene	0.001	2,6-Dinitrotoluene	0.005	2,4,6-Trichlorophenol	0.004
Toluene	0.001	Di-n-octyl phthalate	0.005		
Ethylbenzene	0.001	Fluoranthene	0.001		
Total Xylenes	0.003	Fluorene	0.001		
4-Methyl-2-Pentanone	0.005				
Isobutyl Alcohol	1.000				
1,4-Dioxane	0.001				
PCB's (Method 8082)					
PCB-1016	0.0001	PCB-1232	0.0001	PCB-1248	0.0001
PCB-1221	0.0001	PCB-1242	0.0001	PCB-1254	0.0001
PCB-1260	0.0001				

FIGURE 7A. METHODS AND DETECTION LIMITS

PARAMETER	MDL (mg/L)	METHOD
TOTAL PHENOLICS	0.01	9066
SULFATE	2	ASTM D516-90
TOTAL ALKALINITY	20	2320B
CHLORIDE	1.0	4500-Cl E
KJELDAHL NITROGEN	0.1	351.2
NITRATE/NITRITE	0.1	4500-NO3 F
TOTAL PHOSPHORUS	0.01	4500-P E
TOTAL CYANIDE	0.005	4500-CN G
ALUMINUM	0.05	6010/6020
ANTIMONY	0.001	6020
ARSENIC	0.001	6020
BARIUM	0.005	6010/6020
BERYLLIUM	0.001	6010/6020
CADMIUM	0.0002	6020
CALCIUM	1	6010
CHROMIUM	0.001	6010/6020
HEX. CHROMIUM	0.005	7196
COBALT	0.015	6010/6020
COPPER	0.001	6010/6020
IRON	0.02	6010
LEAD	0.001	6020
MAGNESIUM	1	6010
MANGANESE	0.005	6010/6020
MERCURY	0.0002	7470
MOLYBDENUM	0.025	6010/6020
NICKEL	0.002	6010/6020
POTASSIUM	0.1	6010
SELENIUM	0.001	7741/6020
SILVER	0.0002	6020/7760
SODIUM	1	6010
THALLIUM	0.002	6020/7841
TIN	0.5	6020
VANADIUM	0.002	6010/6020
ZINC	0.1	6010/6020
pH	N/A	4500-H B
BICARBONATE	10.0	2320B
CARBONATE	10.0	2320B
TOTAL ORGANIC CARBON	0.5	5310C
CHEMICAL OXYGEN DEMAND	10.0	5220D
SPEC. CONDUCTANCE	5.0	2510B
SEMI-VOLATILE ORGANICS*	**	8270
VOLATILE ORGANICS*	**	8260
PCB's	**	8082

* see attached lists of compounds

** detection limits are compound dependent

FIGURE 8. METHODS AND DETECTION LIMITS FOR APPENDIX IX PARAMETERS

Constituent	Method	Detection Limit	Unit
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d□t□□□H□	□□□□□	□□□□□	u□□□
□□□ □ □□□H□ □□□nd□n□□	□□□□□	□□□□□	u□□□
□h□rd□n□	□□□□□	□□□□□	u□□□
4□4□DDD	□□□□□	□□□□□	u□□□
4□4□DD□	□□□□□	□□□□□	u□□□
4□4□DDT	□□□□□	□□□□□	u□□□
D□□□dr□n	□□□□□	□□□□□	u□□□
□ph□□□nd□su□□□n	□□□□□	□□□□□	u□□□
□□t□□□nd□su□□□n	□□□□□	□□□□□	u□□□
□nd□su□□□n su□□□t□	□□□□□	□□□□□	u□□□
□ndr□n	□□□□□	□□□□□	u□□□
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H□pt□□h□□r □p□□□d□	□□□□□	□□□□□	u□□□
□s□dr□n	□□□□□	□□□□□	u□□□
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P□□□□□□□□	□□□□□	□□□□□	u□□□
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M□th□□p□r□th□□n	□□□□□	□□□□□	u□□□
Th□□n□□□n□	□□□□□	□□□□□	u□□□
P□r□th□□n	□□□□□	□□□□□	u□□□
Ph□r□t□	□□4□	□□□□□	u□□□
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FIGURE 8. METHODS AND DETECTION LIMITS FOR APPENDIX IX PARAMETERS

Constituent	Method	Detection Limit	Unit
□4□□□TP □S□□□□□□	□□□□	□□□□	u□□□
□4□□□T	□□□□	□□□□	u□□□
□□□t□n□	□□□□	□□□□□	□ □□□
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□r□□ □d□h□r□□ □th□n□	□□□□	□□□□□	□ □□□
□r□□ □□□r□	□□□□	□□□□□	□ □□□
□r□□ □□ □th□n□	□□□□	□□□□□	□ □□□
□□□ut□n□n□	□□□□	□□□□□	□ □□□
□ □r□□n d□su□□d□	□□□□	□□□□□	□ □□□
□ □r□□n T□tr□□h□r□d□	□□□□	□□□□□	□ □□□
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□□□D□h□r□□□n□□n□	□□□□	□□□□□	□ □□□
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□□□□D□r□□ □□ □th□n□	□□□□	□□□□□	□ □□□
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FIGURE 8. METHODS AND DETECTION LIMITS FOR APPENDIX IX PARAMETERS

Constituent	Method	Detection Limit	Unit
Pr□p□□n□tr□□□	□□□□□	□□□□□□□	□ □□□
□□□□□□□□T□tr□□h□□r□□th□n□	□□□□□	□□□□□□□	□ □□□
Tr□h□□r□□□u□r□□ □th□n□	□□□□□	□□□□□□□	□ □□□
□□□□□□Tr□h□□r□pr□p□n□	□□□□□	□□□□□□□	□ □□□
□□□t□ph□n□□n□	□□□□□	□□□□□□□	□ □□□
□□□□t□□□□ □n□□u□r□n□	□□□□□	□□□□□□□	□ □□□
4□□□ □n□□ph□n□□	□□□□□	□□□□□□□	□ □□□
□n□□n□	□□□□□	□□□4□	□ □□□
□r□□ t□	□□□□□	□□□□□□□	□ □□□
□h□r□□□n□□□t□	□□□□□	□□□□□□□	□ □□□
D□□□□t□	□□□□□	□□□□□□□	□ □□□
D□□ □th□□t□	□□□□□	□□□□□□□	□ □□□
p□D□□ □th□□□□ □n□□□□□□□n□□n□	□□□□□	□□□□□□□	□ □□□
□□□□□D□□ □th□□□n□□□□nthr□□n□	□□□□□	□□□□□□□	□ □□□
□□□□D□□ □th□□□n□d□n□	□□□□□	□□□4□	□ □□□
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H□□□□h□□r□d□□□n□□p□d□□□ns	□□□□□	□□□□□□□	□ □□□
H□□□□h□□r□pr□p□n□	□□□□□	P□□	□ □□□
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M□th□p□r□□□n□	□□□□□	□□□□□□□	□ □□□
□M□th□□□h□□□nthr□n□	□□□□□	□□□□□□□	□ □□□
M□th□□□ □th□n□su□□n□t□	□□□□□	□□□4□	□ □□□
□4□□ □phth□□u□□n□	□□□□□	□□□□□□□	□ □□□
□□□ □phth□□□□ □n□	□□□□□	□□□□□□□	□ □□□
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□□□ tr□□□t□u□d□n□	□□□□□	□□□□□□□	□ □□□
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□□□ tr□s□d□n□□ut□□□ □n□	□□□□□	□□□□□□□	□ □□□
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P□nt□□h□□r□□□n□□n□	□□□□□	□□□□□□□	□ □□□
P□nt□□h□□r□d□□□n□□□ur□ns	□□□□□	□□□□□□□	□ □□□
P□nt□□h□□r□d□□□n□□□p□d□□□□ns	□□□□□	□□□□□□□	□ □□□
P□nt□□h□□r□□□th□n□	□□□□□	□□□□□□□	□ □□□
P□nt□□h□□r□n□tr□□□n□□n□	□□□□□	□□□□□□□	□ □□□
Ph□n□□□□t□n	□□□□□	□□□□□□□	□ □□□
p□Ph□n□□□n□□d□□□ □n□	□□□□□	□□□□□□□	□ □□□
□P□□□□□n□	□□□□□	□□□□□□□	□ □□□
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T□tr□□h□□r□d□□□n□□□ur□ns	□□□□□	□□□□□□□	□ □□□

FIGURE 8. METHODS AND DETECTION LIMITS FOR APPENDIX IX PARAMETERS

Constituent	Method	Detection Limit	Unit
T□tr□□h□□r□□□□n□□□p□d□□□□ns	□□□□□	□□□□□□	□ □□□
□T□u□d□n□	□□□□□	□□□□□□	□ □□□
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FIGURE 8. METHODS AND DETECTION LIMITS FOR APPENDIX IX PARAMETERS

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Attachment B5.I
Radiological Monitoring
WAYNE DISPOSAL, INC. SITE #2
MID048090633

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3.0 Personnel Monitoring Program 1
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Addendum

Environmental Radiological Monitoring Program (ERMP)

1.0 Introduction

Wayne Disposal Inc. (WDI) may dispose of Technologically Enhanced Naturally Occurring Radiological Material (TENORM) in accordance with Radiological Waste Acceptance Criteria (WAC) identified in Appendix B of the Waste Analysis Plan. This Attachment outlines radiological monitoring required by Part 111 Section 11132 of Michigan's Natural Resources and Environmental Protection Act, 1994 P.A. 451, as amended. Protocols designed to monitor the environment and personnel for the presence of radionuclides are contained in WDI's Environmental Radiological Monitoring Program (ERMP) included as an addendum. As required by Section 11132(6) at a minimum this monitoring program includes:

A. Radiological monitoring of site workers and at the landfill property boundary
B. Radium-226, Radium-228, and Lead-210 as parameters analyzed in leachate and groundwater

2.0 Environmental Monitoring

The ERMP outlines perimeter air, perimeter passive gamma, groundwater and leachate sampling as required by Section 1132(6)(a) and (b). Program sampling frequencies, and sampling and laboratory analytical methods are specified in the ERMP. In the event samples cannot be obtained during the normal sampling period, where possible resampling events will be scheduled, or the sample will be reported as lost data. Radium-226, radium-228, and lead-210 are included among the parameters analyzed in perimeter air, groundwater and leachate samples. Figures showing the monitoring locations for these parameters can be found in the attachments specified in the table below.

Groundwater ***Attachment B5.A***		**Leachate** ***Attachment B5.H***	**Perimeter Air** ***B5.B***	**Perimeter Passive Gamma**
• OB-40R	• OB-20	Master Cell VI Subcell	• Station 5	• North Perimeter
• OB-19R	• OB-15	• ENE	• Station 8	• East Perimeter
• OB-48	• OB-21	• ENW	• Station 9	• South Perimeter
• OB-50	• OB-47	• ESE	• Station 11	• West Perimeter
• OB-51A	• OB-22	• ESW		
• OB-52	• OB-25	• G		
• OB-53	• OB-24	• F		

3.0 Personnel Monitoring Program

Site workers who handle, inspect, treat and dispose of exempt, low-activity radiological materials and may be exposed to 100mrem/year or more will be monitored by personnel dosimetry that is available for review at the facility. Worker doses, after being corrected for ambient background, are compared to an annual dose limit of 500mrem/yr.

4.0 Self-Monitoring Thresholds

Self-monitoring thresholds are substantially less than the 100mrem/year permissible exposure level for the general public. Thresholds are intended to track non-occupational doses through monitoring and dose calculations and implement controls when necessary. Monitoring data collected is used to calculate potential net annual dose. The dose is then compared to permissible exposure levels.

Thresholds for media have been established at a fraction of each applicable environmental pathway above site background levels as follows:

Table 1. Self-Monitoring Thresholds

	Perimeter Air	Groundwater	Perimeter Passive Gamma
Nuclide	**(uCi/ml)**	**(uCi/ml)**	**(mrem/qtr)**
Ra-226	**2.25E-13**	**1.50E-08**	**25**
Ra-228	**5.00E-13**	**3.00E-08**	
Pb-210	**1.50E-13**	**3.00E-08**	
Th-232	**1.00E-15**	**5.00E-09**	
Th-230	**5.00E-15**	**1.50E-08**	
Th-228	**5.00E-15**	**5.00E-08**	
U-238	**1.50E-14**	**1.00E-07**	
U-235	**1.50E-14**	**1.50E-07**	
U-234	**1.25E-14**	**1.50E-07**	

Air and ground water thresholds are set at 25% of the effluent levels published by the US Nuclear Regulatory Commission or State of Michigan regulatory limits. The tables published in Tables 2 of 10 CFR part 20, Appendix B were utilized in the development of the thresholds. The gamma quarterly investigation levels are set at 25% of the 100mrem above background.

5.0 Data Review/Threshold Exceedances

Data from each quarterly sampling will be reviewed to verify reported levels minus background are below the values in the self-monitoring threshold table. Exceedances, of all matrices that are used for the perimeter dose calculations (i.e. perimeter air and perimeter passive gamma), will trigger WDI to verify doses are below the 100mrem/yr above background limit. If the dose as a result of an exceedance is greater than 100mrems above background, WDI will notify the Michigan Environment, Great Lakes, and Energy (EGLE), Material's Management Division, Radiological Protection Section (RPS), as discussed in the below Reporting section.

For threshold exceedances with respect to matrices that are monitored but are not used in dose calculations (i.e. groundwater) or if the dose calculation cannot be performed, the matrix will be resampled in order to confirm the exceedance. If the resample confirms the exceedance, WDI

will investigate the source of the detection and notify EGLE as discussed in the Reporting section of this attachment.

6.0 Reporting

If the dose at the perimeter exceeds 100mrem/year above background or an exceedance above background of a matrix that is not used in the dose calculation occurs WDI shall notify the Division, Hazardous Waste Section, Permit and Corrective Action Unit, by telephone within one working day of discovering the exceedance. Where applicable, arrangements will be made for resampling as soon as possible to confirm the exceedance.

If confirmed, WDI shall investigate the cause of the exceedance and submit a report to the RPS within 90 days of discovery. The report shall include the following:

- Written description summarizing the potential cause of the exceedance
- Laboratory analytical data and dose calculations (when applicable) used to determine the exceedance
- A description of actions taken to reduce the potential for future exceedances

Results of all environmental monitoring required by Section 1132 will be submitted to the RPS by March 15 of each year. The report shall include the following information:

- A summary of the radiological monitoring performed within the calendar year and a comparison to the self-monitoring thresholds and annualized permissible exposure level to the public.
- Background concentrations utilized in threshold evaluation (per sampling location)
- Calculated dose to the public (See Appendix A of the ERMP)
- Laboratory analytical data collected within the calendar year.
- A summary of any actions taken to reduce exposure (if necessary)
- Laboratory analytical data, monitoring locations, and sampling and analysis methods for voluntary radiological monitoring collected during the calendar year.
- A 3 year trend analysis of perimeter air, penetrating gamma radiation, groundwater, and leachate monitoring data for each location (if historical data is available).

Reports shall be maintained in the operating record until closure of the facility.

Addendum
Environmental Radiological Monitoring Program (ERMP)
WAYNE DISPOSAL, INC. SITE #2
MID048090633

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4.0 Sampling and Analysis Requirements 2
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Figure 1 Required Monitoring Points

1.0 Objective

The purpose of this radiological monitoring plan is to evaluate environmental impacts associated with radiological waste management activities at Wayne Disposal, Inc. (WDI) and to ensure disposal activities are being performed in a manner that minimizes risk to human health and the environment. Unless otherwise specified equipment and sample collection procedures are completed as outlined in WDI's Part 111 Operating License sampling and analysis plans as follows:

- Groundwater Monitoring Sampling and Analysis Plan- Attachment 9
- Leachate Monitoring Sampling and Analysis Plan- Attachment 13

2.0 Required Sampling Locations

Figure 1 includes all required environmental monitoring sampling locations monitored by this program.

3.0 Analytical Methods

Methods identified in Table 1 are methods anticipated to be used. Alternative methods may be required in order to ensure results obtained are most representative. If an alternative method is utilized this will be noted in the annual monitoring report or exceedance notification report along with information explaining why an alternative method was utilized.

Table 1: Anticipated Analytical Methods

ANALYSIS	METHOD
Gamma Spec Full	EPA 901.1
Radium-226	SM7500RaB M or EPA 901.1
Radium-228	EPA 904 or EPA 901.1
Lead-210	Pb-210 DOE RP280 or ALS Pb-210 Soils and Waters
Isotopic Uranium	D3972
Isotopic Thorium	LANL ER200M
Perimeter Passive Gamma	TLD
Passive Gamma Dose	NVLAP*

*National Voluntary Laboratory Assessment Program

4.0 Sampling and Analysis Requirements

4.1 Leachate

For the purposes of this plan, leachate is monitored only from subcells of Master Cell VI in which radiological materials have been disposed including subcells ENE, ENW, ESE, ESW and G.

Analysis is intended to measure radiological constituents that may have leached out of disposed waste. Each of the subcells is analyzed annually for the following required analytical parameters:

- Radium-226
- Radium-228

- Lead-210

Additional parameters that may be analyzed include:

- Gamma Spectroscopy
- Isotopic Uranium
- Isotopic Thorium

All leachate is treated at the facility's wastewater treatment plant by chemical precipitation, clarification, biological destruction, and ultrafiltration, then discharged to the publicly owned treatment works for further treatment. For this reason, the monitoring is only collected for trending and characterization purposes.

4.2 Groundwater

There are 28 groundwater monitoring wells associated with the WDI hazardous waste disposal area of which 14 were selected for inclusion in this monitoring plan based on their proximity to the landfill cells in which radiological materials have been disposed. Wells are sampled annually. Of the 14 wells that are included in this plan, 12 are down gradient and 2 are up gradient of the landfill cells of interest.

Up gradient wells include:

- OB-40R
- OB-19R

Down Gradient wells include:

- OB-15
- OB-20
- OB-21
- OB-22
- OB-24
- OB-25
- OB-47
- OB-48
- OB-50
- OB-51A
- OB-52
- OB-53

Each of the monitoring wells is analyzed annually for the following required analytical parameters:

- Radium-226
- Radium-228
- Lead 210

Additional parameters that may be analyzed include:

- Gamma Spectroscopy
- Isotopic Uranium
- Isotopic Thorium

Samples are not required to be collected within the nitrogen glove box. In the event the sampler believes there is potential for cross contamination due to the atmosphere, they may utilize the nitrogen glove box.

4.3 Perimeter Air

The ambient air quality entering and leaving USEM is monitored at four of the seven stations around the perimeter of the site. Monitoring stations included are 5, 8, 9, and 11 as they are located at each end of the site.

All stations are monitored using a high volume Total Suspended Particulate (TSP) sampler. Sampling dates are staggered in a calendar month to include a variety of days without interfering with the normal

ambient air monitoring program. Sampling is performed once every two weeks for a twenty-four (24) hour period with a nominal flow rate of 50 cfm ± 10 cfm. In the event that a sample cannot be collected due unforeseen circumstances (e.g. power outage), a resampling event will be scheduled. Samples for each station are composited together for digestion on a quarterly basis, rendering a quarterly result. Each of the quarterly samples is analyzed for the following required analytical parameters:

- Radium-226
- Radium-228
- Lead 210

Additional parameters that may be analyzed include:

- Gamma Spectroscopy
- Isotopic Uranium
- Isotopic Thorium

4.4 Perimeter Passive Gamma

Environmental thermoluminescent dosimeters (TLDs) are placed along the perimeter of USEM to measure the potential external dose to members of the public. Sampling locations at USEM include the north, east, west, and south perimeter of the site. The east perimeter sample is used to establish the background of the facility and is used to determine dose exposure above background.

Sampling is continuous and a quarterly value is obtained using the method specified below. In the event a sample cannot be obtained during the quarterly period the location will be reported as lost data.

4.5 Personnel Passive Gamma

External radiation dose to USEM employees that may be exposed to 100mrem/year, is measured by individual monitoring badges (aka dosimeters) issued to workers that directly handle, or are in close proximity to, radiological materials. Sampling is continuous while participating employees are present at the facility (i.e., employees are required to wear their assigned dosimeters whenever at work). Dosimeters are analyzed quarterly. Personnel monitoring is maintained onsite and available for onsite review.

Appendix A

Public Dose Calculation Method

Public Dose

As indicated in the ERMP, monitoring data is used to perform and report potential dose to the members of the public. The following provides the method that will be utilized to calculate public dose. The method relies on WDI's voluntary monitoring. In the event that the voluntary monitoring is not utilized, the data will be reviewed as described in the ERMP's Data Review /Threshold Exceedances section. An alternative method may be utilized, but only if concurrence has been obtained from the RPS.

Below are the assumptions used in calculating public dose:

- Penetrating radiation data (gamma) will be used to determine external dose. The data will be used to determine net yearly external dose.
- Air results will be used to determine part of the inhalation dose. For potential dose to the public, the highest average annual fence line results will be used to determine inhalation dose. Dose conversion factors are used to determine dose with respect to the nuclides monitored for.
- Radon monitoring data is also used to determine inhalation dose. Dose is determined through use of dose conversion coefficients. Equilibrium coefficient is assumed to be 50%
- Soil results are not used as part of the dose calculation. It is assumed that any intake of soil is through inhalation of suspended contaminants in the air.
- Ground water is not used as part of the dose calculations, as the groundwater is not consumed.
- Occupancy time for members of the public at the fence line is given a conservative number of hours, such as 2000hrs. Alternative assumptions may be made, but explanations for the change in assumptions will be documented.
- Breathing rate is assumed to be 1.2 m^3/hr.

The following equation is used for public dose calculations:

Penetrating Radiation Dose (D_γ):

- ($\dot{D}_n$)= Net dose rate obtained from environmental TLDs
- (T) = Occupancy factor

$$D_\gamma = (\dot{D}_n)(T)$$

Airborne Particulate Dose (D_{air}):

- Breathing rate = 1.2 m^3/hr
- (A_i) = Total inhaled activity in units of Bq per each nuclide
- (DCF_i) = Dose conversion Factor in units of Sv/Bq obtained from FGR 11

$$D_{air} = \Sigma\,(DCF_i)(A_i)$$

Radon (D_R):

- (C) = Net average concentration in Bq/m^3
- (DCC) = Dose conversion coefficient 6.4E-6 mSv/(Bq/m^3) hr
- T= Occupancy Factor

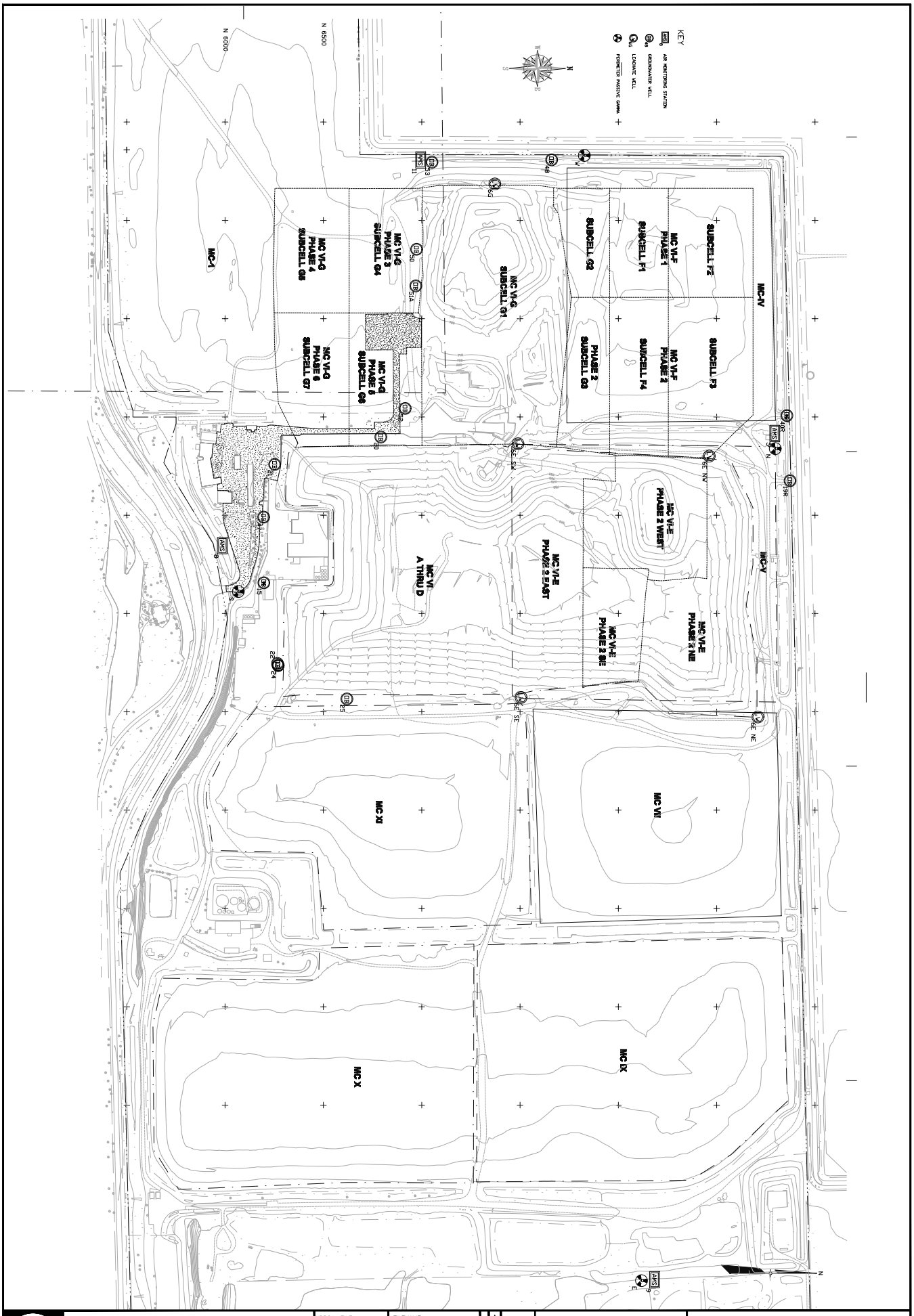
$$D_R = (C)(DCC)(T)$$

Total Potential Dose:

$$D_{Total} = D\gamma + D_{air} + D_R$$

Figure 1

Required Monitoring Points



USE MICHIGAN
WAYNE DISPOSAL INC

REQUIRED RADIOLOGICAL MONITORING POINTS

PROJ. FILE	FILENAME:
WDI	
DATE: 101719	SCALE: N.T.S.
SHEET ___ OF ___	DRN BY: CAG

REVISIONS

A			
B			
C			
D			
E			

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