Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Pilot Test Report

Petroleum Remediation Program
Guidance Document 7-06

Doc Type: Corrective Action Design

Instructions: Complete this report to document the results of a pilot test of a remediation system or other in situ remediation technology. See Guidance Document 7-01 *Corrective Action Design and Implementation* for more information and requirements. Do not revise or delete any text or questions from this report form. Items may be added if they are needed to support the pilot test results. If an item is not applicable, provide a brief explanation.

MPCA Leak ID: 8001 Report date: February 11, 2016

Responsible Party Information

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Mailing address: 102 Main Street

City: Cambridge State: MN 55088

Alternate contact (if any) for responsible party: Ms. Maria Olson Phone: 763-689-2220

Leak Site Information

Leak site name: Former Union 76 Phone: NA

Leak site address: 329 East First Avenue

City: Cambridge MN Zip code: 55088 County: Isanti

Consultant (or other) Information

By signing this document, I/we acknowledge that we are submitting this document on behalf of and as agents of the responsible person or volunteer for this leak site. I/we acknowledge that if information in this document is inaccurate or incomplete, it will delay the completion of remediation and may harm the environment and may result in a reduction in Petrofund reimbursement. In addition, I/we acknowledge on behalf of the responsible person or volunteer for this leak site that if this document is determined to contain a false material statement, representation, or certification, or if it omits material information, the responsible person or volunteer may be found to be in violation of Minn. Stat. § 115.075 (2007) or Minn. R. 7000.0300 (Duty of Candor), and that the responsible person or volunteer may be liable for civil penalties.

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City: Maple Plain State: MN Zip code: 55359

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Name of field technician(s):

Section 1: Pilot Test Overview

1. If the completed pilot test was different than requested by the Minnesota Pollution Control Agency, identify the differences and explain why. **NA.**

2. Identify the person responsible for conducting the pilot test. **Dan Larson.**

   Identify the remediation technology that was tested and the number of remediation and monitoring points that were used.

   Wenck conducted a soil vapor extraction (SVE) pilot test with two SVE wells,15 permanent pilot test monitoring points, and the existing monitoring wells (MW-1, MW-3, MW-5, MW-6, MW-7, MW-8, and MW-9. This system was used to determine develop design parameters for the full-scale of an SVE at the site. Pilot test monitoring points and existing monitoring wells will hereafter be described as monitoring points *(Figure 3)*.

   The pilot monitoring points include one shallow 4" diameter SVE well screened from 5-15 feet below grade and one deep 4" diameter SVE well screened from approximately 9-19 feet below grade. A total of 15 permanent air monitoring points were installed. Nine of the 15 points are deep (15 feet below grade) and six of the points are shallow (5 feet below grade). A nest of shallow and deep points was completed at 5 locations. The other 5 un-nested points consist of 4 deep and 1 shallow point.

3. Provide a chronological list of all pilot test activities and the date each activity was completed.

   November 9-11, 2015: Soil vapor extraction wells and pilot test monitoring points were installed.
   November 16-18, 2015: Pilot test implementation.

4. Describe all permits, approvals, and variances needed prior to pilot test system installation and startup.

   No permits, approvals or variances were needed.

5. Describe any wastes that were generated during pilot test system installation and how they were handled and disposed of. Provide copies of waste disposal documents, permits, and related documentation that were not included in Guidance Document 7-05 *Pilot Test Work Plan* in Appendix A.

   Four drums of soil cuttings were generated during drilling/probing of the soil vapor extraction wells and pilot test monitoring points. These drums are in the process of being characterized for disposal in February or March 2016. No water waste was generated during the well/monitoring point installation or pilot test implementation.

6. Describe any major problems encountered during pilot test system installation, including installation of remediation and monitoring points. Discuss how the problems were resolved and how they affect pilot test results.

   - **Wenck proposed using 20 slot stainless-steel screens for the soil vapor extraction wells. The drilling subcontractor made a mistake and ordered 10 slot screens stainless-steel screens instead of 20 slot screens. The screens were delivered to the site, thus this error was not identified until the day of drilling. Wenck weighed the cost of delaying the SVE well installation versus the potential affect the different screen size would have on the pilot test results. If the slot size is too small, there may not be adequate flow through the screen for maximum radius of influence (ROI) and the vacuum measured in the extraction well could be too high and would not reflect a realistic vacuum. If the slot size is too large for a given air-extraction rate, excessive pressure drop within the screen interval can occur, resulting in diminished ROI.**

     It was determined to continue with installation of the 10 slot screens based on past experience with positive results from both 10 slot and 20 slot screen sizes in sand/silt lithology. Based on pilot test results, it does not appear that the 10 slot screens significantly affected the ROI or extraction well vacuums.

- **Vacuum gauges and pitot tubes installed on the pre-manifold pipes by H2K were not working. Wenck removed them and used the holes to collect measurements using the Fluke 922 Airflow Meter. This instrument was able to measure both vacuum and velocity/flow using a pitot tube. This change did not affect the pilot test results.**

- **The pilot test skid was not constructed such that there was room for measurement of total airflow post-manifold. Wenck collected measurements from each vent well pipe pre-manifold. These measurements were added together for total flow if both wells were being used. Wenck does not believe this affected the pilot test.**

7. Identify any data gaps or inconsistencies in the site investigation, risk evaluation, and monitoring data and discuss resulting major assumptions that affect the pilot test results.

   Based on the extensive amount of investigation, monitoring well sampling, and laser induced fluorescence (LIF) data, there are no major data gaps or inconsistencies identified.

Section 2: Target Zone

Illustrate the target zone's geometry, geology, and hydrogeology and preferential flow routes and flow barriers on a site map and cross sections in Section 15. Include applicable tables and figures from the focused investigation in Appendix B.

1. Identify the primary contaminant phase targeted by the system and describe its physical and chemical properties as relevant to the remediation strategy.

   The goal of the corrective action is to target the light non-aqueous phase liquid (LNAPL) zone and reduce the residual LNAPL. The reduction/cleanup of the LNAPL would reduce residual contributions to the dissolved phase and thereby stabilize/reduce the DRO, GRO, and VOC concentrations in groundwater at the Site and down-gradient of the site. By extracting soil vapor from the vadose zone and soil/water interface, Wenck anticipates a reduction in LNAPL.

   At this time air sparging (AS) is not anticipated to be utilized during initial soil venting. Air sparging may be used with the SVE system in the future, depending on the effectiveness of the SVE system alone. Air sparge points are anticipated to be installed during initial SVE system construction due to the cost savings of not needing to trench/lay piping multiple times. The air sparge points would be installed approximately 10 feet below the average seasonal groundwater table.

2. Describe the geometry, geology, and hydrogeology of the target zone.

   The target zone is the LNAPL in the soil smear zone above the groundwater table. *Figures 4 through 6* and cross section *Figures 10 and 11A-11*C detail the target zone. The chemicals of concern are petroleum hydrocarbons including diesel range organics (DRO), gasoline range organics (GRO), and benzene, toluene, ethybenzene, and xylene (BTEX) compounds. The site geology consists of poorly graded sand and silty sand. The soil profile generally includes a near-surface layer of sandy silt and silty sand between 4 and 8 feet thick. This sand/silt layer is underlain by fine-grained poorly-graded sand. Seasonal groundwater elevations range from approximately 17 to 22 feet below grade. A semi-confining silt/clay layer is present at approximately 30 feet below grade across the Site. Groundwater flow is towards the southwest.

   The mobility of the LNAPL is considered low based on monitoring well observations, LIF data, and the age of the release. However, the existing LNAPL is contributing to the dissolved phase petroleum concentrations down-gradient.

   Describe the remediation strategy for remediating the target zone in terms of the subsurface physical, chemical and biological processes that the full-scale system will be designed to induce and control over time to achieve permanent risk reduction.

   The remediation strategy will be venting the target zone which will reduce the LNAPL and dissolved contaminants. The final system will likely include 6 or 7 soil vapor extraction wells that are cycled off of one or two blowers/enclosures *(Figure 6)*. The pilot test SVE wells (SV-1 and SV-2) will likely be utilized with 4 or 5 additional SVE wells. The number of blowers/enclosures will depend on whether or not we are able to complete directional drilling to connect the two parcels on either side of Buchanan Street. If directional drilling under Buchanan Street is not feasible or possible, two blowers/enclosures would be necessary, one on each parcel.

   Initially, the system will likely run as an SVE system with vacuum divided among 2 or 3 wells at a time. The vacuum and airflows will be monitored and regulated for each well individually to optimize cleanup performance. There will also, initially, be some experimentation with operation of all the wells and different combinations, along with different amounts of dilution air. The ROI and PID results will be measured during different the combinations to determine the most effective vent well combination. This combination will also change with time to affect different areas of the target zone at different times.

   Air sparge may be introduced at a later time, depending on the effectiveness of the stand-alone SVE system. Air sparging would be pulsed throughout operation to maximize the operation and minimize preferential pathways while

maintaining control on vapor emissions and confirmation of sub-surface vapor capture. Once the concentrations of organic vapor recovery reach asymptotic levels, Wenck anticipates the following possible next steps:

- **Request closure based on low air emission concentrations and significant reduction of petroleum concentrations in monitoring wells near the source area from venting alone.**
- **Request closure based on low air emission concentrations, significant reduction of petroleum concentrations in monitoring wells near the source area from venting alone, and confirmation of cleanup with LIF probes conducted in the source area.**

3. If applicable, describe target-zone accessibility issues or subsurface conditions that act as a barrier to or short-circuit the intended subsurface response and how they were accommodated by the pilot test system design.

   The sub-surface is relatively consistent and conducive to the SVE/AS remedial approach, in particular below 8 feet. Utilities, land access and sub-surface vapor control are the primary conditions that require special attention. In general the site is well suited for SVE/AS remediation. One concern was whether or not there would be short-circuiting to the gravel and grassy surfaces in the area. The pilot test confirmed there are one or two silty sand, sandy silt, or clayey sand layers down to approximately 4 to 8 feet *(Appendix C)*. Based on this, it appears there is an airflow cap covering the entire area.

Section 3: Remediation and Monitoring Points

Provide a site map showing the locations of all pilot test remediation and monitoring points. Include construction diagrams, borings logs, and, if applicable, Minnesota Department of Health (MDH) *Well and Boring Records* in Appendix C. Provide a remediation and monitoring point construction summary table in Section 16 (Table 1).

1. Provide a rationale for the location and construction specifications (e.g., screen interval, distance from source) for each remediation and monitoring point based on the target zone, remediation strategy, and conceptual design of the full-scale system.

   The pilot test included two SVE wells (SV-1 and SV-2). The the "deep well" (SV-1) was screened from 9-19' below grade and the "shallow well" (SV-2) was screened from 5-15' below grade. The SVE wells are 4-inch diameter and were constructed in a way that they could eventually be incorporated into the final system. Pilot test monitoring points were installed shallow at 5' and deep at 15' to measure the radius of influence (ROI) horizontally and vertically from the SVE wells. See *Figure 3* for the proposed plan view layout and *Figure 11C* for cross-section detail for vertical layout.

2. Describe remediation and monitoring point installation activities, including the methods and procedures used for drilling and installation of each remediation and monitoring point.

   <u>SVE Well Construction</u>
   Well and monitoring point construction diagrams are shown on *Figure D101 in Appendix D*. The wells were installed using a hollow-stem auger rig with a 10 inch (OD) boring diameter. The SVE well screens were 10 slot wound stainless steel, 10 feet in length, and the riser pipes were schedule 40 PVC. The wells were finished above-grade with a traditional protop with locking cover. These protops are considered temporary as they will be removed and replaced with an at-grade manhole, with lateral connections below grade.

   <u>Monitoring Point Construction</u>
   Un-Nested Points:
   A one-foot deep hollow-stem auger hole was drilled using 10-inch (OD) augers. Geoprobe dual-tube tooling was advanced to the desired depth (5 feet for shallow and 15 feet for deep). A 12-inch, stainless-steel implant (with attached anchor) was attached to the appropriate colored tubing (blue for deep and green for shallow) and lowered through the tooling string to near bottom. Filter pack sand was placed around the implant and to one foot above the top of the implant (Dual-tube tooling was gradually removed during this process). Bentonite crumbles (dry) was placed approximately 1 foot above the filter pack. A small amount of water was added to the top of this first lift of bentonite (tremied to avoid getting inner dual tube rods wet). Additional bentonite was added and hydrated in approximate one-foot lifts to approximately one foot below the surface as tooling was gradually removed from the ground. The monitoring point was completed with a 6-inch, flush-mount hand hole. The hand hole was completed with auger cuttings around the outside to fill the remaining annular space of the 10-inch borehole. The hand hole was completed at a depth such that snow plows and/or lawn mowers would not interfere with it. A vinyl tubing cap was placed on the tubing the tubing was labeled (shallow or deep) and coiled inside of the hand hole. See boring logs/construction diagrams in *Appendix C* and *Figure D101 in Appendix D.*

   Nested Points: A one-foot deep hollow-stem auger hole was drilled using 10-inch (OD) augers. Geoprobe dual-tube tooling was advanced to the desired depth (15 feet). The 12-inch implant and anchor was attached to the blue colored tubing and lowered through the tooling string to the bottom. Filter pack sand was placed around the implant and to one foot above the top of the implant (Dual-tube tooling was gradually removed during this process). Bentonite crumbles (dry) were placed approximately 1 foot above the filter pack. A small amount of water was poured on top of this first lift of bentonite (tremied to avoid getting inner dual tube rods wet). Additional bentonite was added and hydrated in approximate one-foot lifts as tooling was removed from the ground to a depth of 5.5 feet. Another 12-inch implant and anchor was then attached to the green colored tubing and lowered through the tooling string to a depth of

5 feet. Filter pack sand was placed around the implant approximately six inches below the bottom and one foot above the top of the implant (Dual-tube tooling was gradually removed during this process). Bentonite crumbles (dry) were placed approximately 1 foot above the filter pack. A small amount of water was poured on top of this first lift of bentonite. Additional bentonite was added and hydrated in approximate one-foot lifts to a depth of one foot below grade as tooling was removed from the ground. The monitoring point was completed with a 6-inch, flush-mount hand hole. The hand hole was completed with auger cuttings around the outside to fill the remaining annular space of the 10-inch borehole. The hand hole was completed at a depth just below surrounding grade such that snow plows and/or lawn mowers would not interfere or damage the surface completion. A vinyl tubing cap was placed on the tubing and the tubing was labeled (shallow or deep) and coiled inside of the hand hole. See boring logs/construction diagrams in *Appendix C* and *Figure D101 in Appendix D.*

3. Describe the results of any sampling, monitoring, or laboratory analyses completed during installation. Provide data summary tables in Section 16 and laboratory analytical reports in Appendix D.

   No sampling, monitoring, or laboratory analyses was completed during remediation and monitoring point installation, with the exception of PID readings measured during installation of the soil vapor extraction wells (SV-1 and SV-2). These PID results are shown on the boring logs included in *Appendix C*.

4. Describe any remediation and monitoring point installation and construction decisions that were made in the field and what criteria were used.

   As discussed in Section 1, Wenck proposed using 20 slot stainless-steel screens for the soil vapor extraction wells. The drilling subcontractor made a mistake and ordered 10 slot screens stainless-steel screens. The screens were delivered to the site. This error was not identified until the day of drilling. Wenck weighed the cost of delaying the SVE well installation versus the potential affect the different screen size would have on the pilot test results. If the slot size is too small, there may not be adequate flow through the screen for maximum radius of influence (ROI) and the vacuum measured in the extraction well could be too high and would not reflect a realistic vacuum. If the slot size is too large for a given air-extraction rate, excessive pressure drop within the screen interval can occur, resulting in diminished ROI.

   It was determined to continue with installation of the 10 slot screens based on past experience with positive results from both 10 slot and 20 slot screen sizes in sand/silt lithology. Based on pilot test results, it does not appear that the 10 slot screens significantly affected the ROI or extraction well vacuums.

5. Describe the methods and procedures for developing remediation and monitoring points and the development results.

   There was no need to develop vadose zone monitoring points.

6. Discuss the status of each remediation and monitoring point after the test was completed.

   All of the monitoring points remain intact. The SVE wells were finished above-grade with a traditional protop with locking cover. These protops are considered temporary as they will be removed and replaced with an at-grade manhole, with lateral connections below grade. Concrete was not used inside of the protop to prevent damage to the pvc riser during construction of the final system.

   Monitoring points are semi-permanent as they are set in the ground, but not cemented in. The handholes protecting the sample tubing are slightly recessed to prevent snow plows or lawn mowers from damaging them.

Section 4: System Equipment, Process Flow, and System Controls

Include a process and instrumentation diagram (P&ID) representing the equipment configuration(s) that was pilot tested in Section 15. Use unique identifiers to refer to specific items on the P&ID when describing system equipment, process flow, and monitoring of pilot test system functions. Refer to remediation point construction diagrams, site maps, or other figures as necessary to describe specific system equipment and processes. When describing major equipment or instrumentation, refer to appropriate manufacturer- or vendor-supplied manuals or excerpts included in Appendix E.

1. Identify the pilot test system's major equipment and discuss their operation principles, performance specifications, and operating ranges.

   - **5 HP URAI24 rotary lobe blower (75 CFM @ 14" Hg vacuum)**
   - **VLS-100 Moisture separator, with high level switch, sight glass, and drain valve**
   - **SVE vacuum switch**
   - **6' X 10' Trailer for blower skid assembly**
   - **Control panel, with starters, overloads, and breakers necessary to run equipment**

   The pilot test equipment selected produced the desired ROI for the known soil types of the area. The P&ID is shown on *Figure 12*.

2. Describe how the major equipment was connected to each other and to the remediation points through conveyance lines and manifold design.

   Each 4" SVE well was connected to the blower skid in the following order:

   - **4" SVE well riser pipe**
   - **4" x 2" Fernco reducer**
   - **2" 90 degree elbow with glued clear plastic pvc pipe**
   - **2" fernco connector**
   - **2" flexible hose (25')**
   - **2" fernco connector**
   - **2"x 3" 90 degree elbow**
   - **3" PVC pipe on blower skid**

3. Describe process flow for all gases, liquids, solids, and their mixtures through the system from intake points to discharge points. Identify passive control features such as gravity drainage and backflow prevention.

   Gases flowed from the two SVE wells to:

   - **Two 3" PVC pipes**
   - **Each 3" pipe had a hole for pitot tube and a hole for vacuum measurement**
   - **Ball valve on each 3" pipe**
   - **4" manifold pipe**
   - **VLS-100 Moisture separator, with high level switch, sight glass, and drain valve**
   - **Vacuum gauge**
   - **Lateral 2" pipe with gate valve and inlet silencer**
   - **Air filter**
   - **5 HP URAI24 rotary lobe blower**
   - **2" effluent/discharge pipe with thermometer**
   - **Sample port with ball valve**
   - **Discharge silencer**

4. Identify the locations of process control devices, including those located along conveyance lines from intake points to discharge points and at remediation points. For each location, describe what process the device controlled and the purpose for controlling the process at that location. Describe the operation principles for each device, including manual adjustment methods and procedures and logic for automated controls.

   Ball valves were used to adjust airflow in each vent well (pre-manifold). The gate valve was used to add dilution air.

5. Identify the control settings that were monitored over the course of the test. Describe the units of measurement, range, accuracy, and data collection methods and procedures as appropriate for each control setting.

   The ball valve adjustments were not monitored, they were either 100% open or 100% closed. The gate valve for dilution air was monitored using vacuum readings in each pipe (pre-manifold). The gate valve was adjusted to achieve vacuum readings approximately one-half of the normal vacuum measurements (see *Section 7* for further information).

6. Identify all locations where process material physical parameters (e.g., flow, pressure, temperature, fluid levels) were measured along conveyance lines from intake to discharge points and at active remediation points. For each location, describe what materials and properties were measured and why they were measured at that location. Describe the operation principles, measurement units, range, and accuracy for each instrument. Describe data collection methods and procedures for each instrument. Include an excerpt from the airflow measurement instrument's manual describing how to convert measured flow rates to standard temperature and pressure conditions in Appendix E.

   - **Hole in each 3" pipe for pitot tube**

   Velocity and airflow measurements were collected at the first hole in each pipe. This location was chosen by H2K as a representative location to collect accurate velocity and airflow measurements for each SVE well. Velocity and airflow measurements were collected using a Fluke 922 Airflow meter/digital monometer. The velocity range is 250-16,000 fpm. The velocity accuracy is 2.5% of reading at 2,000 fpm. The airflow range is 0-99,999 cfm. The airflow accuracy is indicated as a "function of velocity and duct size" according to the manual. Plumbers putty was used to seal around the tubing/hole to ensure accurate readings. Tape was used to cover each hole when not in use.

   - **Hole in each 3" pipe for vacuum measurements**

   Vacuum measurements were collected at the second hole in each pipe. This location was chosen by H2K as a representative location to collect accurate vacuum measurements for each SVE well. Vacuum measurements were collected using a Dwyer Series 477 Digital Manometer. The range is 0-200 inH2O. The accuracy is + or – 0.10%.

Plumbers putty was used to seal around the tubing/hole to ensure accurate readings. Tape was used to cover each hole when not in use.

- **Vacuum gauge (post moisture separator)**

This was a direct-read vacuum gauge, installed on the equipment provided by H2K. This location was chosen by H2K as a representative location to collect total vacuum readings for the system.

- **2" effluent/stack pipe with thermometer**

This was a direct-read thermometer, installed on the equipment provided by H2K. This location was chosen by H2K as a representative location to collect temperature readings of effluent air from the system.

- **Sample port with ball valve**

This sample port was used for both photoionization (PID) readings and TO-15 samples. This sample port location was chosen because it was after the blower and before the stack silencer, providing a representative sample equivalent to stack discharge of the eventual SVE system. PID readings were collected using a MiniRae Lite. The range is 0.1 ppm to 5,000 ppm. The accuracy is + or – 5%.

7. Identify instruments (or methods) that were used to monitor equipment operation parameters, such as equipment run time and on/off cycles. Describe what parameters were monitored and the purpose for monitoring them. Describe each instrument's operation principles, measurement units, range, and accuracy.

   NA.

8. Describe the results of any testing, such as pressure testing, that was completed prior to system startup at the conveyance lines, manifolds, and equipment from the remediation points through the rest of the system to confirm that they were not leaking or otherwise compromised. Describe testing methods and procedures.

   The blower skid was designed and assembled by H2K. H2K indicated they completed a soap test on air lines after construction of the blower skid. This consisted of running the blower and spraying joints with soap to make sure it did not bubble or get sucked into the line.

Section 5: Process Material Chemistry

Refer to the P&ID and, if necessary, other figures and diagrams when describing the locations where process materials (e.g., groundwater, air) were monitored or sampled for chemical parameters.

1. Identify all monitoring and sampling locations between intake points and discharge points, including remediation points. For each monitoring and sampling location, describe the process material that was monitored or sampled, the chemical parameters that were measured, and the purpose for collecting the data at that location.

   - **Sample port with ball valve**

   This sample port was used for both photoionization (PID) readings and TO-15 samples. This sample port location was chosen because it was after the blower and before the stack silencer, providing a representative sample equivalent to stack discharge of the eventual SVE system.

2. Describe field monitoring methods and procedures. For each monitoring location, describe monitoring equipment and/or instrumentation, including operation principles, measurement units, range, and accuracy.

   VOC sampling was completed by connecting tubing to the sample port and the 1 liter summa canister. A moisture filter was connected between the summa canister and sampling port. The summa canisters were fitted with 200 milliliters per minute flow restrictor (approximately 5 minutes per sample).

3. For each parameter collected for off-site laboratory analysis, describe collection methods and procedures, selected laboratory analytical methods and their rationale, and quality assurance and quality control (QA/QC) measures.

   The first VOC sample (E-1) was collected from the effluent sample port during Test #1 at approximately 30 minutes after startup (11/16/15, 12:56-1:05 PM). Both SVE wells were open 100% with no dilution air.

   The second VOC sample (E-2) was collected at the approximate ½ way point of the pilot test (11/17/15, 1:10 to 1:18 PM) after Test #2. This second sample was collected during Test #3, which was created specifically for the VOC sample and both SVE wells were open 100% with no dilution air.

   The third and final VOC sample (E-3) was collected at the end of the pilot test (11/18/15, 3:57 to 4:04 PM) after Test #6. This sample was collected during Test #7, which was created specifically for the VOC sample and both SVE wells were open 100% with no dilution air.

The laboratory analytical method for VOC air sampling was EPA Method TO-15 which is the standard analytical method for these samples. The laboratory reports and QA/QC protocols followed by the analytical laboratory (Pace Analytical) are included in the lab reports in Appendix D.

4. For chemistry data used in mass balance calculations or for other reasons requiring associated flow, identify the flow measurement locations and instruments (described in Section 4) associated with respective monitoring or sampling points.

   The following flow measurements were recorded during collection of effluent VOC (TO-15) samples.

Effluent Sample ID	Test #	Effluent Sample Time	Airflow Measurement Time	Total Vacuum InH2O	SV-1 Airflow (CFM)	SV-2 Airflow (CFM)	Total Airflow (CFM)
E-1	Test #1	12:56 to 1:05 PM	1:45 PM	25	34	55	89
E-2	Test #3	1:10 to 1:18 PM	1:18 PM	32	36	86	122
E-3	test #7	3:57 to 4:04 PM	4:00 PM	31.5	47	44	91

Section 6: Subsurface Response Monitoring

For each item below, identify the monitoring points where the system's effects on the specified target-zone conditions were measured over the course of the pilot test. Describe the types of data that were collected at each monitoring point and provide a rationale for collecting each type. Describe data collection methods and procedures including the type, operation principles, measurement units, range, and accuracy of field instruments. Refer to appropriate figures and diagrams to identify measurement locations and to support monitoring methods and procedures.

1. Target zone's physical conditions (e.g., fluid levels, pressure, temperature):

   Pilot monitoring points and monitoring wells were monitored with a Fluke 922 Airflow meter /digital monometer for differential pressure reading. There were 22 different monitoring points that were measured between 5 to 8 times for each run. Monitoring points were measured for differential pressure until the measurements reached stabilization. See Table 1 for pilot test monitoring point data results.

2. Target zone's chemical conditions (e.g., organic vapor concentrations, dissolved oxygen, redox potential) as measured in the field:

   PID measurements were collected at blower stack sample port. See Table 3.

3. Target zone's chemical conditions (e.g., volatile organic compounds (VOCs), gasoline range organics (GRO), diesel range organics (DRO)) as measured by laboratory analysis:

   Effluent samples were collected for laboratory analysis by EPA method TO-15 VOCs as described in Section 5.

Section 7: Pilot Test Description and Data Presentation

Refer to appropriate tables, figures, and appendices when describing system configurations, control adjustments, and data collection locations. Provide pilot test figures and data tables in Sections 15 and 16, respectively. Include laboratory analytical reports in Appendix D and attach field or sampling data sheets in Appendix F. All data must have a temporal reference point relative to the start of the pilot test or given stage. This section is to include mass removal and waste treatment data, if applicable.

1. Briefly summarize the pilot test from start to finish, including baseline monitoring, equipment testing, start and stop times of stages and step tests, downtime between stages, and rebound monitoring, as applicable.

   Day 1 (11/16/2015)

   <u>Setup (8:00 AM to 9:47 AM)</u>

   <u>Baseline Monitoring (9:48 AM to 11:15 AM)</u>
   Prior to starting the SVE system, all 22 monitoring points were measured for differential pressure.

   <u>Test #1 (12:20 PM to 4:45 PM)</u>
   During this initial test both wells were open 100% and there was no dilution air. Effluent sample E-1 was collected during this test.

Day 2 (11/17/2015)

Test #2 (8:50 AM to 1:00 PM)
During this test SV-1 was open 100%, SV-2 was closed and there was no dilution air.

Test #3 (1:05 PM to 1:20 PM)
This test was only for collecting the 2nd VOC sample (E-2). Both wells were open 100% and there was no dilution air.

Test #4 (1:22 PM to 3:32 PM)
During this test SV-1 was closed, SV-2 was open 100% and there was no dilution air.

Rebound Measurements (3:37 to 3:47)
After Test #4, 14 of the monitoring points were measured after shutdown of the system for the day.

Day 3 (11/18/2015)

Test #5 (8:50 AM to 11:45 AM)
During this test SV-1 was open 100%, SV-2 was closed and there was 50% dilution air. To achieve this, the dilution air gate valve was closed until the vacuum in the SV-1 line was at approximately ½ of the vacuum in SV-1 for Run #4. Test #4 had vacuum readings in SV-1 at approximately 51 inches H2O. Thus, the vacuum was set to approximately 25 inches H2O. The gate valve needed to be closed or opened slightly during the test to maintain 25 inches H2O in SV-1.

Test #6 (11:46 AM to 3:35 PM)
During this test SV-1 was closed, SV-2 was open 100% and there was 50% dilution air. To achieve this, the dilution air gate valve was closed until the vacuum in the SV-2 line was at approximately ½ of the vacuum in SV-1 for Test #4. Test #4 had vacuum readings in SV-1 at approximately 54 inches H2O. Thus, the vacuum was set to approximately 27 inches H2O. The gate valve needed to be closed or opened slightly during the test to maintain 27 inches H2O in SV-2.

Test #7 (3:35 PM)
This test was only for collecting the 3rd VOC sample (E-3). Both wells were open 100% and there was no dilution air.

Disassemble Equipment/Cleanup (3:35 PM to 4:30 PM)

2. Describe any baseline data (e.g., groundwater elevations, light non-aqueous phase liquid thicknesses) collected prior to initiating the pilot test. Provide a rationale for the types, locations, and collection frequency of the data that were collected.

   Prior to starting the SVE system, all 22 monitoring points were measured for differential pressure to establish a baseline and validate the differential pressures during the pilot test.

3. Describe baseline data collection methods and procedures, including field equipment and laboratory analytical methods, if applicable.

   The baseline testing consisted of turning the SVE system on using the same parameters as Test #1 and measuring differential pressure in all 22 monitoring points. The monitoring points and monitoring wells were monitored with a Fluke 922 Airflow meter /digital monometer for differential pressure.

4. Describe the results of any remediation and monitoring point testing, such as pressure testing, that was completed prior to system startup to confirm that they were not short circuiting, leaking, or otherwise compromised and were in hydraulic or pneumatic connection with the target zone. Describe testing methods and procedures.

   There was no remediation or monitoring point testing. As previously indicated, the blower assembly was soap tested by H2K before being delivered to the site.

5. Describe the results of any conveyance line, manifold, and equipment testing, such as pressure testing, that was completed prior to system startup to confirm that they were not leaking or otherwise compromised. Describe testing methods and procedures.

   There was no remediation or monitoring point testing. As previously indicated, the blower assembly was soap tested by H2K before being delivered to the site.

6. Describe the equipment configuration and remediation and monitoring points that were used during each stage of the pilot test in order of stage completion. Provide a rationale for the configuration and order. Describe the transition between each stage, including any downtime due to equipment reconfiguration. Describe any major problems encountered during operation, how the problems were resolved, and how they affected the results.

   The equipment configuration and remediation and monitoring points during each individual test did not change, with the exception of opening and closing ball valves for SV-1 and SV-2 and opening the gate valve for adding dilution air.

As shown in question 1 above, there was very little down time between each test. Also note that the system did not operate after hours since the site was not secured.

The majority of the pilot test was run during rainy and windy conditions, with heavy rain at times. Wenck constructed a temporary canopy over the SVE trailer/skid to be able to keep working.

7. Describe the types, collection locations, and collection frequency of operation monitoring data (e.g., system control settings, process material parameters, subsurface response) that were collected during each stage. Provide the rationale for collecting each data type at the locations and frequency.

   The following SVE system measurements were recorded approximately 4 to 5 times during each test:

   - **SV-1 vacuum (inches H2O) – pre-manifold, if ball valve was open.**
   - **SV-2 vacuum (inches H2O) – pre-manifold, if ball valve was open.**
   - **SV-1 air velocity (FPM) – pre-manifold, if ball valve was open.**
   - **SV-2 air velocity (FPM) – pre-manifold, if ball valve was open.**
   - **SV-1 airflow (CFM) – pre-manifold, if ball valve was open.**
   - **SV-2 airflow (CFM) – pre-manifold, if ball valve was open.**
   - **Total vacuum (inches H2O) – post manifold and moisture separator**
   - **Stack temperature (Fahrenheit) – effluent pipe**
   - **PID reading – sample port in effluent pipe**

   These measurements were generally taken in between the monitoring point measurements.

8. Identify the process and/or operation monitoring data that were used as criteria to determine when a given stage was complete.

   Each test was run until differential pressure readings in the monitoring points stabilized.

9. Describe and provide the rationale for system control adjustments that were made over the course of each stage, including adjustments for step tests. Describe what process flow parameter(s) was controlled (e.g., flow rate, pressure), how it was controlled, and what process and/or subsurface response was monitored for effect.

   System control adjustments were not generally made during east test. The primary goal was to get accurate differential pressure readings in the monitoring points to determine the radius of influence under different SVE configurations.

10. If a step test was conducted, describe and provide the rationale for the number and sequence of steps. Specify what parameter (e.g., flow rate, pressure) was adjusted, how it was adjusted, and whether it was a step up or step down. Identify the process and/or operation monitoring data that were used as criteria to determine when a given step was complete.

    The tests completed as described in question 1 above will be useful to some extent as a step test. Additional step tests would have been completed if more time was available; however, the primary goal of identifying the ROI was achieved.

11. Describe any rebound data collected after pilot test completion. Provide the rationale for the types, locations, and collection frequency of the data that were collected.

    The only rebound data collected was after test #4 as described in question 1 above.

12. Describe rebound data collection methods and procedures, including field equipment and laboratory analytical methods, if applicable.

    After Test #4, 14 of the monitoring points were measured for vacuum after shutdown of the system for the day.

Section 8: Data Evaluation

Provide data evaluation figures and tables in Sections 15 and 16, respectively. Refer to appropriate figures and tables when describing evaluation results.

1. Provide and explain the equation(s) that were used for converting airflow velocity measurements to volumetric airflow rates and/or volumetric airflow rates to standard temperature and pressure conditions. Describe each equation variable, including its data source (i.e., instruments) and measurement unit. Provide example calculations using pilot test data.

   Airflow measurements were collected using a Fluke 922 Airflow meter/digital monometer, no conversion was needed.

2. Provide and explain the equations that were used for calculating mass removal. Describe each equation variable, including its data source and unit of measurement. Provide example calculations using pilot test data.

Emission Rate (Total VOCs) = Effluent Concentration * flow rate.
15.15 lbs/hr = 44,453,800 ug/m^3 * 91 ft^3/min * 60 min/hr * 1 m^3/35.31 ft^3 * 2.205 e^{-9} lbs/1 ug

Mass Removed per day = Emission Rate * 24
363.6 lbs/day = 15.1 lbs/hr * 24 hrs/day

While three effluent VOC samples were collected under the same system operating conditions, only the third/last effluent sample (E-3) was used in the emission rate calculation as it was deemed the most representative of initial operation of a permanent system with the same size blower, two SVE wells in the source area, and no dilution air. Note that O-Xylene was detected in E-1 and E-2 but not in E-3. Wenck used a concentration of 31,300 ug/m^3, just below the detection limit of 31,400 ug/m^3.

The pilot test calculated mass removal is likely overstated as there will be additional SVE wells outside of the source area, mixing cleaner air with the source area well(s). Sample E-3 was collected at the end of the 3-day pilot test.

The flow rate measurement used in the above calculation was taken during the collection of sample E-3. This flow rate was the addition of the flow rates in SV-1 (47 CFM) and SV-2 (44 CFM).

3. Discuss pilot test data evaluation results. Describe the methods (e.g., contour maps, graphs) and calculations used to evaluate each data set.

Radius of influence contour maps were created for each of the following test runs. These contour maps were created using only the deep monitoring points because the shallow monitoring points generally had lower vacuum readings than their corresponding deep monitoring point. Also, monitoring well MW-3 did not indicate any vacuum, likely due to very little, if any screen exposed above the water table. The last round of vacuum measurements for each test were used to create the contour maps. All vacuum readings are shown on *Table 1*.

<u>Test #1 (both wells were open 100%, no dilution air)</u>

This initial test resulted in an estimated ROI of 330 feet using 0.1 inches H2O as the ROI boundary. There was also an approximate 130 foot ROI at 1 inches H2O (See Figure 13).

<u>Test #2 (SV-1 was open 100%, SV-2 was closed and no dilution air)</u>

This test resulted in a ROI of approximately 200 feet using 0.1 inches H2O as the ROI boundary. There was also an approximate 120 foot ROI at 1 inches H2O (See Figure 14).

<u>Test #4 (SV-1 was closed, SV-2 was open 100% and no dilution air)</u>

Test #4 created a ROI of approximately 240 feet using 0.1 inches H2O as the ROI boundary. The ROI at 1 inches H2O was approximately 140 feet (See Figure 15).

<u>Test #5 (SV-1 was open 100%, SV-2 was closed and dilution air was added to achieve ½ the vacuum of Test # 2)</u>

This test resulted in a ROI of approximately 200 feet using 0.1 inches H2O as the ROI boundary. There was also an approximate 100 foot ROI at 1 inches H2O (See Figure 16).

<u>Test #6 (SV-1 was closed, SV-2 was open 100% and dilution air was added to achieve ½ the vacuum of Test #4)</u>

This test resulted in a ROI of approximately 220 feet using 0.1 inches H2O as the ROI boundary. The ROI at 1 inches H2O was approximately 100 feet (See Figure 17)

Section 9: Technical Feasibility Determination

For each applicable category below, discuss whether and how the results confirm the technical feasibility of the technology and equipment configuration when employed as the full-scale system envisioned in the conceptual design from Section 5 of Guidance Document 7-02 *Conceptual Corrective Action Design Report (CCAD)*.

1. Subsurface response and control within the target zone.

The results of the pilot test indicate a much larger ROI (up to 330 feet) than the ROI speculated on in the CCAD (20 feet). The deeper portion (6-20') of the target zone is generally uniform and produces a mostly symmetrical ROI. There is less response in the shallow (<6') target zone, due to silt layers. This is not detrimental to the feasibility of a full-scale system as LNAPL is more prevalent in the deeper zone at the water table. The silt layers will actually aid in minimizing short-circuiting in grassy and gravel areas at the Site.

The pilot test indicated that the shallow SVE well (SV-2) resulted in a slightly larger ROI than the deeper well (SV-1). The screen for vent well SV-1 was likely 6 inches to 1 foot below the water table during the pilot test. This may have

resulted in pulling water up into the screen, reducing the screened area in the vadose-zone. The ideal SVE screen placement would be at or near the water table, but not submerged in it (a few inches above the water table); however, due to the fluctuating water table (approximately 3 feet) it is not possible to achieve this year round. Given the minor difference in ROI between the two pilot test vent wells, the placement of vent well screens above the water table is not critical. However, it may be advantageous to place the bottom of future vent well screens at a depth such that they are exposed for the majority of time. Wenck will set each vent well screen approximately one foot above the average groundwater elevation for that area.

2. Targeted contaminant phase mass removal or in situ elimination.

   As demonstrated in the mass removal rate calculation, mass removal of VOCs will be high during operation of the full-scale system, especially at start-up.

3. Light non-aqueous phase liquid (LNAPL) handling, storage, and disposal.

   LNAPL will not be generated during operation of the full-scale system.

4. Wastewater treatment and/or discharge.

   It is not anticipated that wastewater will be generated in large amounts during operation of the full-scale system. Any water accumulated in the knock-out tank will be drummed for disposal.

5. Air emissions control.

   Air emissions control may be necessary, depending on how the full-scale system is designed and operated, (i.e., how much dilution air will be used and other factors). Wenck will follow the MPCA Air Emission Controls Guidance Document 7-09a and complete the Air Emissions Screening Spreadsheet during completion of the SDCAD.

6. Other elements of the full-scale system's conceptual design.

   Wenck indicated in the CCAD that once the concentrations of organic vapor recovery reach asymptotic levels, air sparge wells will be introduced to release additional VOCs for capture by the SVE system. After reviewing results of the pilot test, it's possible air sparging may not be needed. To determine this, Wenck may propose a limited LIF investigation to confirm the reduction of LNAPL. Monitoring well data would also be evaluated to determine the soil venting system effectiveness on reducing dissolved contaminant concentrations in the groundwater. However, Wenck anticipates that to reach LNAPL not exposed to the vadose zone, air sparging will be needed. At this point it is anticipated that air sparge points and lateral piping will be installed during trenching for the vent piping.

7. Do the pilot test results demonstrate technical feasibility of the technology and equipment configuration?

   ☒ Yes (Go to Section 10.)

   ☐ No (Skip Sections 10 and 11. Go to Section 12.)

Section 10: Conceptual Design Update

For each applicable category below, discuss how the results affect the full-scale system's conceptual design assumptions made in Section 5 of the CCAD.

1. System mechanical components, instrumentation, and controls.

   The conceptual design assumptions for system mechanical components, instrumentation and controls have not change based on results of the pilot test.

2. Remediation point construction and well field layout.

   The following CCAD conceptual estimates were made based on an effective radius of influence of 20 feet from each SVE and AS well:

   - **Twelve (12) deep SVE wells screened from 17-22 feet so the screened interval intersects with the groundwater table and the LNAPL target zone.**
   - **Five (5) medium depth SVE wells installed above the water table, screened from 12-17 feet.**
   - **Three (3) shallow SVE wells installed at the source area and screened from 5-15' to control potential vapor migration, especially during the air sparge remediation stage.**
   - **Three (3) sparge wells screened from 25-27 feet below grade within the groundwater table.**

   Based on results of the pilot test, Wenck anticipates the full-scale system to have the following remediation point components (see *Figure 6*):

- **One (1) SVE well screened 9-19 feet (existing SV-1)**
- **One (1) SVE well screened 5-15 feet (existing SV-2)**
- **Five (5) SVE wells screened approximately 955 to 945 feet, or approximately 7 to 17 feet below grade.**
- **Three (3) sparge wells screened from 26-28 feet below grade within the groundwater table.**
- **Nine (9) deep and six (6) shallow monitoring points (existing)**

Adding five SVE wells would give us 7 total SVE wells surrounding the 3 proposed air sparge wells. A screen interval of 7 to 17 feet will accomplish both remediating LNAPL in the vadose zone and at the water table along with controlling potential vapor migration.

3. LNAPL handling, storage, and disposal.

   LNAPL will not be generated during operation of the full-scale system.

4. Wastewater treatment.

   It is not anticipated that wastewater will be generated in large amounts during operation of the full-scale system. Any water accumulated in the knock-out tank will be drummed for disposal.

5. Air emissions control.

   Air emissions control may be necessary, depending on how the full-scale system is designed, how much dilution air will be used and other factors. Wenck will follow the MPCA Air Emission Controls Guidance Document 7-09a and complete the Air Emissions Screening Spreadsheet during completion of the SDCAD. As mentioned in the CCAD: discharge treatment by carbon may be added to the process if necessary

6. Operation monitoring schedule.

   Operation monitoring will include documenting system vacuum and airflow measurements along with individual SVE well vacuum and airflow measurements. Analytical samples will also be collected from the discharge effluent for VOC analysis. These measurements/samples will be collected more frequently during initial startup of the system. Also, during startup, individual SVE wells and dilution air will be adjusted to optimize the system.

   After the first two or three weeks, the site visits will decrease to approximately one visit per week and eventually go to semi-monthly.

7. Remediation endpoints and operation duration.

   The pilot test results do not significantly affect the full-scale system's conceptual design assumptions made in Section 5 of the CCAD. The remediation strategy will be venting the target zone which will reduce the LNAPL and dissolved contaminants. The final system will likely run off of two blower/enclosures since the LNAPL plume extends across Buchanan Street. Horizontal drilling may be employed, if feasible, to allow for only one blower/enclosure.

   Initially, the system will run as an SVE system with both shallow and deep wells connected to the manifolds, where vacuum and airflows will be monitored and regulated for each well individually to optimize cleanup performance. Wenck indicated in the CCAD that once the concentrations of organic vapor recovery reach asymptotic levels, air sparge wells will be introduced to release additional VOCs for capture by the SVE system. After reviewing results of the pilot test, it's possible air sparging may not be needed.

   Wenck anticipates that to reach LNAPL not exposed to the vadose zone, air sparging may be needed. At this point it is anticipated that air sparge points and lateral piping will be installed during trenching for the vent piping, to conserve costs and avoid disturbing private property twice. If air sparging is introduced it will be pulsed throughout operation to maximize the operation and minimize preferential pathways while maintaining control on vapor emissions and confirmation of sub-surface vapor capture.

   Once the concentrations of organic vapor recovery reach asymptotic levels, with or without air sparging, Wenck anticipates the following possible next steps:

   - **Request closure based on low air emission concentrations and significant reduction of petroleum hydrocarbon concentrations in monitoring wells near the source area.**

   - **Request closure based on low air emission concentrations, significant reduction of petroleum hydrocarbon concentrations in monitoring wells near the source area, and confirmation of cleanup with LIF probes conducted in the source area. The benchmark for residual impacts as determined by the LIF investigation will be a response of <10% fluorescence throughout the existing impacted area.**

The operational duration of the system is difficult to estimate at this time. System performance and effectiveness monitoring data will be used to develop an estimate of the anticipated operations duration.

8. Equipment maintenance schedule.

   This soil venting/air sparge system is expected to require very little maintenance.

9. Other elements of the full-scale system's conceptual design.

   N/A

Section 11: Economic Feasibility Determination

Based on the information discussed in Section 10, provide an updated life-cycle cost estimate for the proposed full-scale system in Appendix G. Update focused investigation and pilot test costs to reflect actual costs.

1. Discuss the updated life-cycle cost estimate. Describe any major assumptions that were made in order to estimate costs.

   The life-cycle cost has been updated and is included in Appendix G.

2. Compare the updated life-cycle cost estimate to the life-cycle cost estimate presented in the CCAD and discuss the results of this comparison.

   The life-cycle cost for the planned SVE/air sparge remediation has gone down from $544,000 to $407,000 based primarily on reducing the number of SVE wells due to a larger than anticipated ROI.

3. Discuss whether the pilot test results significantly affect the assumptions made when preparing life-cycle cost estimates for the non-selected corrective action alternatives evaluated in the CCAD.

   The pilot test indicated a much higher ROI, reinforcing the chosen remediation technology, SVE/air sparge.

4. List the corrective action alternatives evaluated in the CCAD with their corresponding and, if applicable, updated life-cycle cost estimate totals. Compare the life-cycle costs of the alternatives with the updated life-cycle cost estimate of the proposed full-scale system.

   The corrective action alternatives included:

   - **Chemical Injection (Cost table was not produced due to high cost)**
   - **Excavation**
   - **Dual Phase Soil Vapor Extraction**
   - **SVE/Air Sparge**

   SVE/air sparge was previously the lowest cost alternative and still is the lowest cost alternative.

5. Based on the cost-estimate comparison and any other relevant factors, discuss the economic feasibility of the full-scale system.

   Soil venting/air sparging is economically the most feasible remediation alternative. The pilot test confirmed there is a near-surface silty cap across the site, which channels the airflow a great distance laterally through the more permeable sand. This large ROI will, result in less vent wells and trenching and faster cleanup time than was originally anticipated. Also, it's possible the site may achieve regulatory closure without employing air sparging.

Section 12: Site Conceptual Model Update

Include updated cumulative tables and figures from Guidance Document 4-06 *Investigation Report Form* in Appendix H. Include documentation of additional site investigation, site monitoring, and interim corrective actions in Appendix I. Also include copies of tables, figures, or other information from the focused investigation if relevant to the site conceptual model or the pilot test design in Appendix B.

1. Describe any additional site investigation, site monitoring, and/or interim corrective actions completed since the last submitted report.

   Wenck has been conducting monthly product level checks on the monitoring well network. Wenck has also completed three rounds of quarterly groundwater sampling at the Site for 2015 and one round in 2016. The results of the product level checks and sampling are included on the attached tables in *Table 1* and *Appendix F*.

   As requested by the MPCA, quarterly monitoring well sampling was completed on May 8, August 13, and November 3, 2015 and February 2, 2016. Wenck also completed monthly light non-aqueous phase liquid (LNAPL) measurements on MWs 3, 7, 8, and 9 in March 2015 through January 2016. The February 2016 monthly (LNAPL) measurements for

monitoring wells 3,7,8,and 9 also included recently installed Soil Vapor Extraction well (SVE-1). Monitoring wells and historical sampling locations are shown on the attached Figures.

2. Discuss the results of the additional site investigation, site monitoring, and/or interim corrective actions.

Monthly product checks were completed on wells MW-3, MW-7, MW-8, and MW-9.

LNAPL was not observed during this report period and has not been observed in any well since the March 6, 2015 monthly product check. Samples were collected the last three quarters of 2015 as well as the first 2016 quarterly sampling event. Petroleum VOC concentrations have generally been stable or declining in the wells sampled.

The cumulative data collected from these sampling events is recorded on the updated Tables attached in *Appendix H*. The laboratory analytical reports are attached in *Appendix D*.

3. Provide an updated and comprehensive site conceptual model.

LNAPL
The laser induced fluorescence (LIF) boring data from the Focused Investigation Report shows that LNAPL from the release is defined. Data collected from the first quarterly event in February 2014 showed 0.52 feet of LNAPL in MW-3 and 0.02 feet of LNAPL in MW-7. The results of product level checks on March 6, 2014 revealed 0.53 feet in MW-3 and 0.03 feet in MW-7. However, from June 2014 through March 2015, only trace levels (approximately 0.01') of product were measured in MW-3, MW-7, and MW-8. The LIF investigation data shows a defined source area of LNAPL that is present at and above the groundwater extending down-gradient of the release area. The LNAPL at the Site appears relatively stable, however, it is contributing to down-gradient impacts to the dissolved phase.

Groundwater
Groundwater monitoring/investigation has been ongoing at the Site since June 1995. Concentrations of DRO, GRO, and BTEX are relatively stable compared to historical data. Groundwater analytical data is shown on Table 11. Sites within the contaminant plume utilize the City Water supply and no private well have been identified. The proposed remedial system will reduce and eventually eliminate LNAPL, resulting in a reduction of on-site and down-gradient dissolved phase petroleum hydrocarbon concentrations.

Vapor Intrusion
As noted in the Focused Investigation Report, in 2011, Liesch collected three soil vapor samples to assess off-Site vapor intrusion potential. Vapor Pt #1 was collected west of the Midwest Environmental Consulting building located at 145 Second Avenue SE, Vapor Pt #2 was collected on the east side of the American Legion Building located at 200 Second Avenue SE, and Vapor Pt #3 was collected to the east of the Cambridge Bible Bookstore located at 220 Main Street South. All vapor samples were collected at depths between 6-8 feet below grade. No detectable concentrations of VOCs were identified in Vapor Pt #1 and Vapor Pt #3. Vapor Pt #2 (American Legion) defected several VOCs. Benzene was detected at 84.6 ug/m³ and 1,3-butadine was detected at 64.5 ug/m³. MPCA guidance document 4-01a provides guidelines for comparing soil gas sample results to 10 times (10x) the ISV and 100 times (100x) the ISV. Benzene detected at 86.6 ug/m³ in Vapor Pt #2 exceeds the 10x Residential ISV of 45 ug/m³, but does not exceed the 10x Industrial ISV of 130 ug/m³ or the 100x Residential ISV 450 ug/m³. While 1,3 Butadiene exceeds the 100x Residential ISV of 30 ug/m³, 1,3-Butadine is not anticipated to be a compound associated with the identified release. The results are shown on Table 20.

In 2011, Liesch collected a subslab vapor sample beneath the basement of the American Legion building to assess the potential for vapor migration into the building. Petroleum VOCs were not detected above 10x the MPCA Residential or Industrial ISVs in sample Subslab-1 (Table 20). Based on results of the Subslab-1 sample beneath the American Legion building, there does not appear to be a vapor pathway between the deeper (18-20') dissolved phase petroleum impacts and the American Legions subslab.

In addition, an updated utility vapor survey was conducted in 2011 and no petroleum vapors were identified. Elevated concentrations of VOC exist in the groundwater. However, the low concentrations of VOCs detected in the soil vapor data and the age of the release suggest that much of the volatilization associated with the release has already occurred. Thus, the vapor intrusion risk is low and no vapor mitigation is recommended at this time.

Surface Water Receptors
***Figure 1* shows the Rum River located west of the Site. The Rum River is located approximately 4,000 feet down-gradient of**
the release and 3,500 feet from the leading edge of the contamination plume. Based on the distance to the Rum River, the risk to this receptor is considered low.

Section 13: Recommendations

1. If the pilot test results support the proposed corrective action, provide a schedule for submitting Guidance Document 7-07a *Remediation System Detailed Corrective Action Design Report (SDCAD)*. If not, recommend an alternative course of action and a schedule for submitting a revised CCAD.

   Wenck anticipates submitting the SDCAD (Guidance Document 7-07a) approximately 45 to 60 days after receiving MPCA approval of the Pilot Test Report.

2. Provide recommendations for additional site investigation, site monitoring, and/or interim corrective actions to be completed prior to corrective action design approval, including their purpose and schedule for completion.

   - **Sample monitoring wells according to the following schedule for 2015:**
     - **Quarterly: MWs 1, 3, 6, 7, 8, 9, and 10**
     - **Semi-annually: MW-11**
     - **Annually: MW-6A**
   - **Monitoring wells will be sampled for diesel range organics (DRO), gasoline range organics (GRO), and benzene, toluene, ethylbenzene, and xylenes (BTEX). A duplicate sample will also be collected for DRO, GRO, and BTEX once per sampling round.**
   - **Measure water levels in all wells on a quarterly basis.**
   - **Measure LNAPL in wells 3, 7, 8, and 9 on a monthly basis. LNAPL will also be measured in SV-1 until the full-scale system is installed.**

Section 15: Figures

Attach new figures specific to this report in order of discussion in the text. All figures must include a north arrow, scale, and legend as applicable. Approximate scales are not acceptable. Figures required in Appendix H should not be included in this section. New figures must include those listed below. Attach additional figures as needed and list below.

☒ One or more site maps showing (as applicable):

- Structures
- Boring and well locations (including any drinking water wells on site)
- Suspected source(s) of LNAPL
- Locations and depths of on-site buried utilities
- All past and present petroleum storage tanks, piping, dispensers, and transfer areas
- Horizontal extent of LNAPL
- Horizontal extent of the target zone
- Remediation and monitoring points, conveyance lines, equipment shed, and waste discharge locations

Distinguish sequential elements of investigations by dates, symbols, etc. in the legend.

☒ Cross sections depicting target-zone geometry, geology, and hydrogeology and preferential flow routes and barriers to flow

☒ Process and instrumentation diagram

Figures Included:

Figure 1 – Site Location Map
Figure 2 – Aerial Site View
Figure 3 – SVE Wells and Monitoring Points
Figure 4 – LIF Maximum Fluorescence Contour Map <15'
Figure 5 – LIF Maximum Fluorescence Contour Map <15'
Figure 6 – Existing and Proposed SVE System Features
Figure 7 – Utility Locations
Figure 8 – Groundwater Gradient Contour Map
Figure 9 – End Points of Geologic Cross Sections
Figure 10 – Cross Section A-A'
Figure 11A – Cross Section B-B' (Southwest)
Figure 11B – Cross Section B-B' (Middle)
Figure 11C – Cross Section B-B' (Northeast)
Figure 12 Process and Instrumentation Diagram
Figure 13 – ROI – Test #1 – Both SV-1 and SV-2
Figure 14 – ROI –Test #2 – SV-1 Only
Figure 15– ROI – Test #4 – SV-2 Only
Figure 16 – ROI – Test #5 – SV-1 Only with 50% Dilution Air
Figure 16 – ROI – Test #6 – SV-2 Only with 50% Dilution Air

Section 16: Tables

Attach new tables specific to this report in order of discussion in the text. Tables required in Appendix H should not be included in this section. New tables must include those listed below. Attach additional tables as needed and list below.

☐ *Table 1* Remediation and Monitoring Point Construction Summary

Table 1 – Pilot Test and Monitoring Point Data Sheets

Table 2 – Effluent Analytical Summary Table

Table 3 – Total VOC concentrations

Section 17: Appendices

Attach all required or applicable appendices in the following order. Indicate those appendices that are included in this report by marking the check box. All reproduced data must be legible. Attach additional appendices as needed and list below.

☐ *Appendix A* Waste handling and disposal documentation, required permit/approval applications and/or acquired permit/approvals, and Guidance Document 7-09b *Air Emissions Screening Spreadsheet* documentation.

☐ *Appendix B* Focused investigation tables, figures, and other information, if applicable.

☒ *Appendix C* Boring logs, construction diagrams, and MDH *Well and Boring Records* for all remediation and monitoring points.

☒ *Appendix D* Copies of laboratory analytical reports, including a copy of the chain-of-custody form. Include laboratory QA/QC data, chromatograms, and MDH laboratory certification number.

☒ *Appendix E* Excerpts from manufacturer- or vendor-supplied equipment and instrumentation manuals.

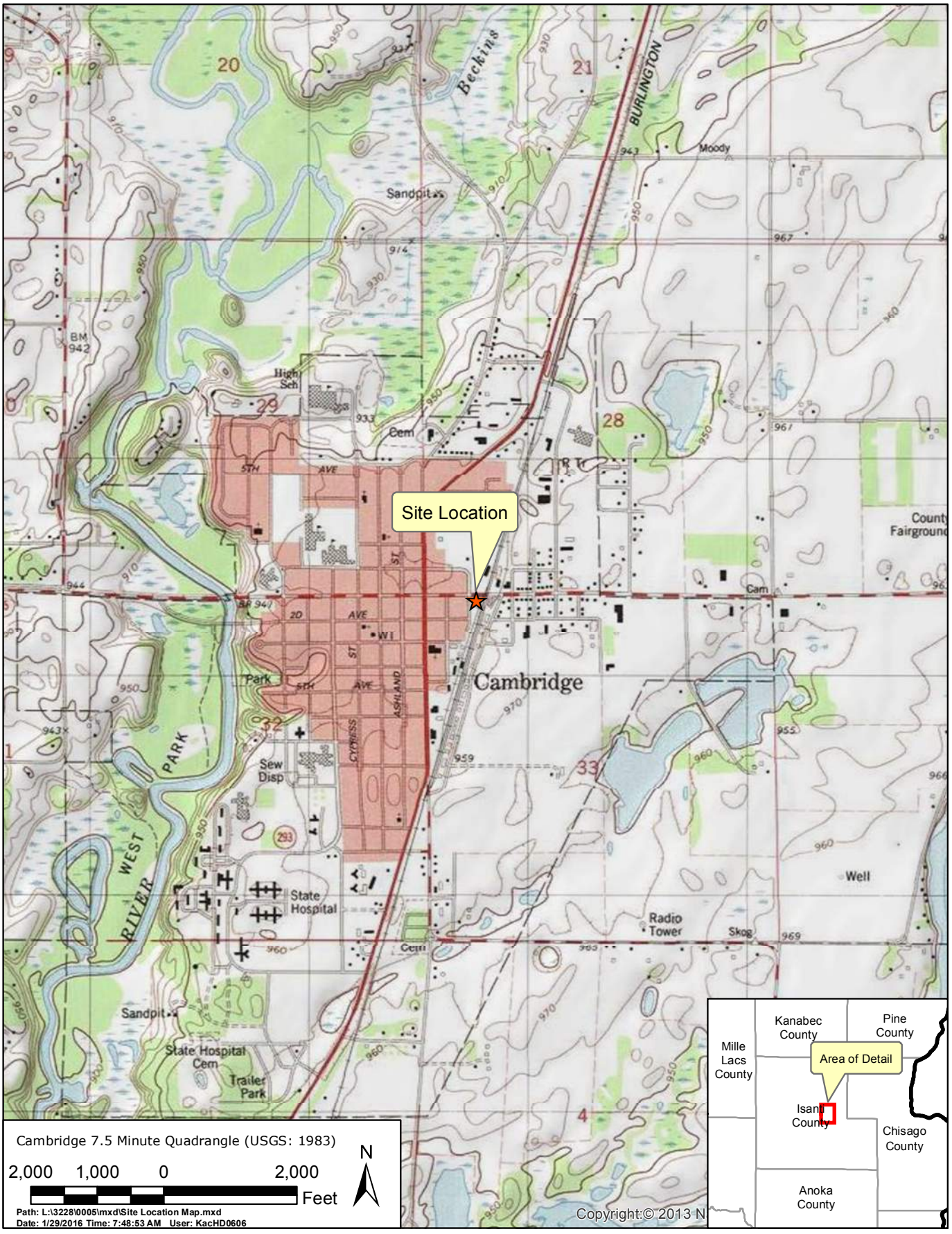
☒ *Appendix F* Field or sampling data sheets or logs (sampling forms, field crew notes, etc.).

☒ *Appendix G* Updated life-cycle cost estimate for the proposed corrective action and, if applicable, updated life-cycle cost estimates for non-selected alternatives.

☒ *Appendix H* Cumulative and updated tables and figures from Guidance Document 4-06 *Investigation Report Form*.

☒ *Appendix I* Additional site investigation, site monitoring, and interim corrective action methods and procedures and associated documentation (boring logs, sampling information forms, laboratory analytical reports, etc.).

Figures



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Site Location Map		Figure 1

MILLE LACS OIL COMPANY

Aerial Site View

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

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Figure 2

MILLE LACS OIL

SVE Wells and Monitoring Locations

WENCK ASSOCIATES

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Figure 3

Plot Date & Time: 4 February 2016 7:07 AM

SOUTH ADAMS STREET

ALLEY

CASEY'S

NORDBERG ELECTRIC

SHED

AMERICAN LEGION

UNION 76

SOUTH BUCHANAN STREET

RR ROW / PROPERTY BOUNDARY

RAILROAD TRACKS

2nd AVENUE

TH-12
TH-17
TH-13
TH-15
MW-8
MW-7
VAPOR PT. 2
TH-16
MW-9
TH-14
TH-22
TH-7
MW-2/TH-6
LGP-1-12
TH-23
TH-24
TH-9
MW-3/TH-8
TH-10
MW-11
TH-11
MW-6
MW-6A
TH-20
TH-19
TH-18
TH-28

L-47 <2%
L-46 <2%
L-45 <2%
L-44 <2%
L-43 <2%
L-42 <2%
L-11 <2%
L-12 <2%
L-24 <2%
L-8 30%
L-7 21%
L-19 43.7%
L-23 7%
L-13 <2%
L-6 63%
L-22 <2%
L-14 <2%
L-3 71%
L-1 156%
L-2 147%
L-4 9%
L-5 <2%
L-21 <2%
L-15 <2%
L-9 54%
L-18 <2%
L-25 <2%
L-16 <2%
L-10 6%
L-26 <2%
L-17 <2%
L-27 <2%
L-39 <2%
L-40 <2%
L-36 <2%
L-37 <2%
L-38 <2%
L-20 <2%
L-28 <2%
L-35 <2%
L-34 <2%
L-30 <2%
L-29 <2%
L-33 <2%
L-32 <2%
L-31 <2%
L-41 <2%
L-60 <2%
L-54 <2%
L-53 <2%
L-52 <2%
L-51 <2%
L-50 <2%
L-49 <2%
L-48 <2%
L-59 <2%
L-58 <2%
L-57 <2%
L-56 <2%
L-55 <2%
L-62 <2%
L-61 <2%

20%
40%
60%
100%
140%

0 20 40
GRAPHIC SCALE IN FEET

LEGEND
- TARGET ZONE 0'-15'
- 20% LNAPL>10% 0'-15'
- TH-22 SOIL BORING
- LGP-1-12 SOIL BORING (SEPT 2012)
- MW-3/TH-8 MONITORING WELL
- L-7 LIF/EC PROBE (MAR 2011)
- L-56 LIF-EC PROBE (SEPT 2012)

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR REVIEW	CVE	APZ	2/27/14

SEAL

PRIME CONSULTANT
WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.
1800 PIONNER CREEK CENTER
MAPLE PLAIN, MN 55359
763.479.4200
763.479.4242

PROJECT TITLE
PILOT TEST
FORMER UNION 76
CAMBRIDGE, MN
MILLE LACS OILS

SHEET TITLE
LIF MAXIMUM FLUORESENCE CONTOUR MAP <15 FT

DWN BY	CHK'D	APP'D	DWG DATE
CVE	AZ		FEB. 2016

SCALE AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
3228-0009	FIGURE 4	

M:\3228\0009\Figure 4 - LIF MAX FLOR.dwg

Plot Date & Time: 4 February 2016 7:08 AM

SOUTH ADAMS STREET

ALLEY

CASEY'S

NORDBERG ELECTRIC

UNION 76

AMERICAN LEGION

SHED

SOUTH BUCHANAN STREET

2nd AVENUE

RR ROW / PROPERTY BOUNDARY

RAILROAD TRACKS

TH-12
TH-17
TH-15
MW-8
TH-13
MW-7
TH-7
MW-2/TH-6
LGP-1-12
TH-23
TH-24
MW-3/TH-8
TH-9
TH-10
TH-14
TH-11
MW-11
VAPOR PT. 2
TH-16
MW-9
TH-22
MW-6
MW-6A
TH-20
TH-19
TH-18
TH-28
R PT. 3

L-11 <2%
L-24 <2%
L-12 6%
L-8 13%
L-47 <2%
L-46 <2%
L-45 <2%
L-44 <2%
L-42 <2%
L-43 <2%
L-7 16%
L-19 10%
L-23 7%
L-13 18%
L-6 20%
L-22 16%
L-14 31%
L-1 23%
L-2 18%
L-3 71%
L-4 14%
L-5 9%
L-39 <2%
L-40 12%
L-36 <2%
L-37 <2%
L-38 12%
L-21 24%
L-20 16%
L-15 16%
L-28 7%
L-35 24%
L-34 6%
L-30 <2%
L-29 15%
L-9 10%
L-18 <2%
L-25 14%
L-16 21%
L-10 3%
L-26 4%
L-17 <2%
L-27 5%
L-41 11%
L-33 14%
L-32 18%
L-31 20%
L-60 4%
L-54 3%
L-53 4%
L-52 <2%
L-51 9%
L-50 <2%
L-49 <2%
L-48 <2%
L-59 4%
L-58 <2%
L-57 <2%
L-56 <2%
L-55 <2%
L-62 <2%
L-61 <2%

5%
10%
15%
20%
25%
35%

0 20 40
GRAPHIC SCALE IN FEET

LEGEND
- 5% TARGET ZONE 17'-22'
- 10% LNAPL>10% 17'-22'
- TH-22 SOIL BORING
- LGP-1-12 SOIL BORING (SEPT 2012)
- MW-3/TH-8 MONITORING WELL
- L-7 LIF/EC PROBE (MAR 2011)
- L-56 LIF-EC PROBE (SEPT 2012)

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR REVIEW	CVE	APZ	2/27/14

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WENCK ASSOCIATES
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MAPLE PLAIN, MN 55359 763.479.4242

PROJECT TITLE
PILOT TEST
FORMER UNION 76
CAMBRIDGE, MN
MILLE LACS OILS

SHEET TITLE
LIF MAXIMUM FLUORESCENCE CONTOUR MAP >15 FT

DWN BY	CHK'D	APP'D	DWG DATE
CVE	AZ		FEB. 2016

SCALE AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
3228-0009	FIGURE 5	

M:\3228\0009\Figure 5 - LIF MAX FLOR-1.dwg

Plot Date & Time: 4 February 2016 7:08 AM

MW-1/TH-4
P-5S
UNION 76
MW-2/TH-6
P-4D
CASEY'S
NORDBERG ELECTRIC
PILOT TEST SVE WELLS
10%
20%
P-3S/3D
SV-1
SV-2
P-9S/9D
P-2S/2D
P-6D
MW-3/TH-8
P-1S
SHED
MW-8
MW-7
PROPOSED ENCLOSURE
20%
AMERICAN LEGION
P-10S/10D
PROPOSED ENCLOSURE
P-7S/7D
MW-9
P-8D
MW-11
2nd AVENUE
10%
MW-6A
MW-6
SOUTH ADAMS STREET
ALLEY
SOUTH BUCHANAN STREET
RR ROW / PROPERTY BOUNDARY
RAILROAD TRACKS

N

0 20 40
GRAPHIC SCALE IN FEET

LEGEND

- TARGET ZONE 0'–12'
- TARGET ZONE 12'–22'
- PROPOSED AIR SPARGE WELL
- SHALLOW SVE WELL 5'–15'
- DEEP SVE WELL
- MONITORING POINT 5' (SHALLOW)
- MONITORING POINT 15' (DEEP)
- MW-3/TH-8 MONITORING WELL
- PROPOSED DEEP SVE WELL

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR REVIEW	CVE	APZ	2/27/14

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PROJECT TITLE
PILOT TEST
FORMER UNION 76
CAMBRIDGE, MN

MILLE LACS OILS

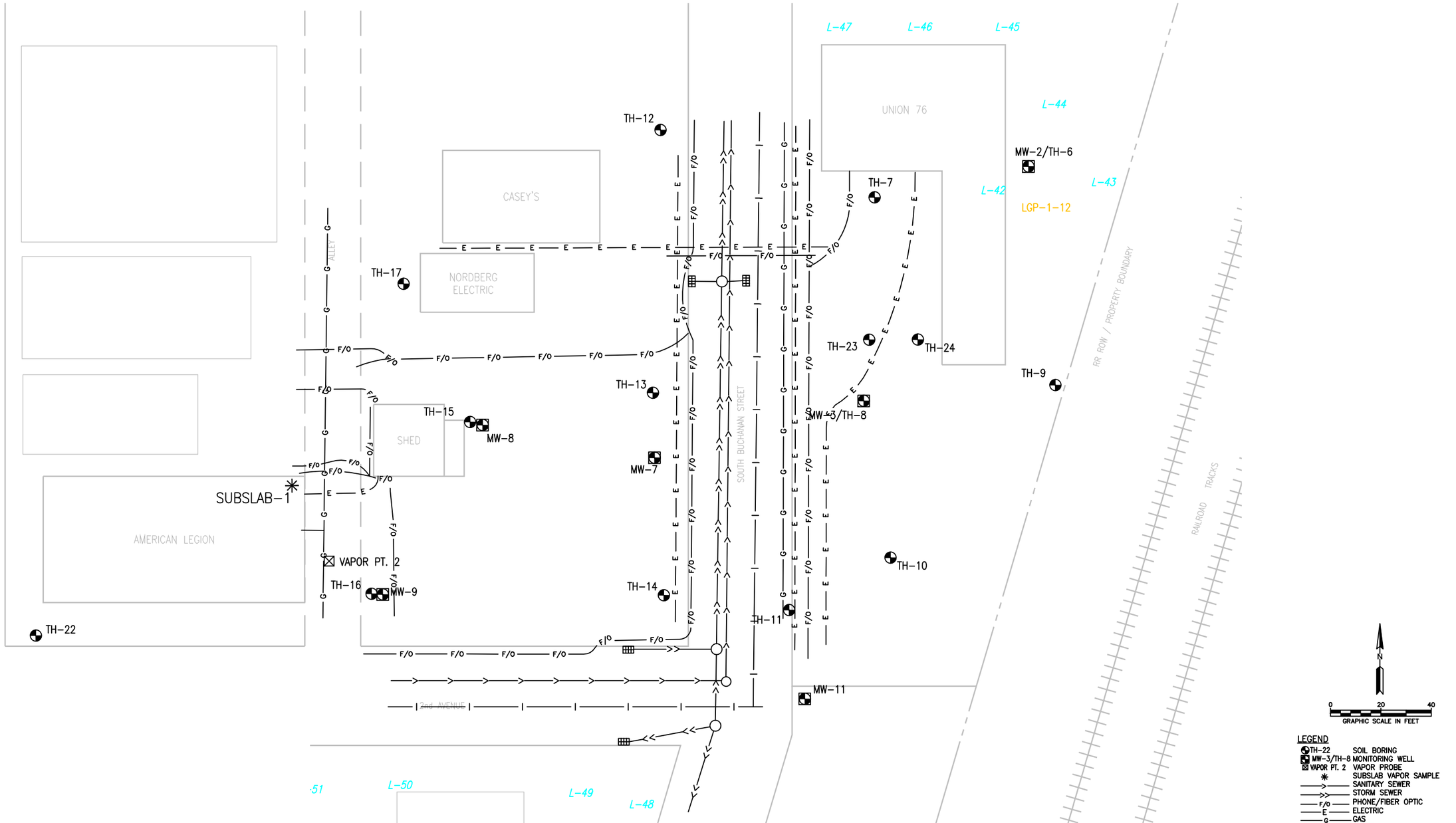
SHEET TITLE
EXISTING AND PROPOSED SVE SYSTEM FEATURES

DWN BY	CHK'D	APP'D	DWG DATE	FEB. 2016
CVE	AZ		SCALE	AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
3228–0009	FIGURE 6	

M:\3228\0009\Figure 6 – PROPOSED WELL LOCATIONS.dwg

Plot Date & Time: 4 February 2016 7:08 AM



REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR REVIEW	CVE	APZ	2/27/14

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PROJECT TITLE

PILOT TEST
FORMER UNION 76
CAMBRIDGE, MN

MILLE LACS OILS

SHEET TITLE

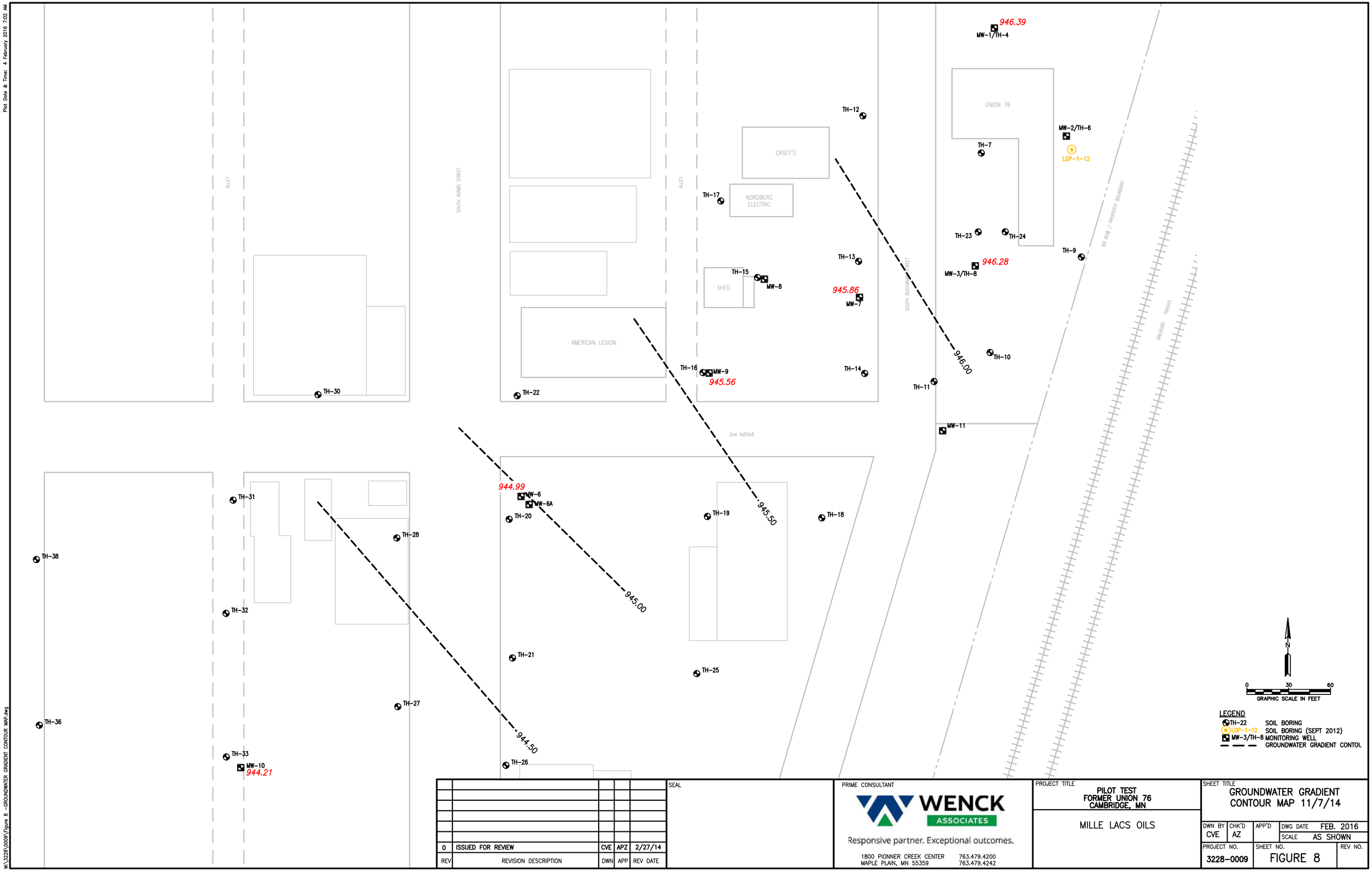
UTILITY LOCATIONS

DWN BY	CHK'D	APP'D	DWG DATE	FEB. 2016
CVE	AZ		SCALE	AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
3228-0009	FIGURE 7	

M:\3228\0009\Figure 7 - UTILITY LOCATIONS.dwg

Plot Date & Time: 4 February 2016 7:02 AM



REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR REVIEW	CVE	APZ	2/27/14

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MAPLE PLAIN, MN 55359 763.479.4242

PROJECT TITLE

PILOT TEST
FORMER UNION 76
CAMBRIDGE, MN

MILLE LACS OILS

SHEET TITLE

GROUNDWATER GRADIENT CONTOUR MAP 11/7/14

DWN BY	CHK'D	APP'D	DWG DATE	FEB. 2016
CVE	AZ		SCALE	AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
3228-0009	FIGURE 8	

M:\3228\0009\Figure 8 -GROUNDWATER GRADIENT CONTOUR MAP.dwg

Plot Date & Time: 4 February 2016 7:05 AM

1st AVENUE

2nd AVENUE

3rd AVENUE

MAIN STREET

ALLEY

SOUTH ADAMS STREET

SOUTH MAIN STREET

RR ROW / PROPERTY BOUNDARY

RAILROAD TRACKS

CASEY'S

NORDBERG ELECTRIC

AMERICAN LEGION

SHED

UNION 76

KLUCK OIL

TH-10 TH-11 TH-12 TH-13 TH-14 TH-15 TH-16 TH-17 TH-18 TH-19 TH-20 TH-21 TH-22 TH-23 TH-24 TH-25 TH-26 TH-27 TH-28 TH-30 TH-31 TH-32 TH-33 TH-34 TH-35 TH-36 TH-37 TH-38 TH-39

GP-1 GP-2

VAPOR PT. 1 VAPOR PT. 2 VAPOR PT. 3

MW-1/TH-4 MW-2/TH-6 MW-3/TH-8 MW-5 MW-5A MW-6 MW-6A MW-7 MW-8 MW-9 MW-10 MW-11

L-1 L-2 L-3 L-4 L-5 L-6 L-7 L-8 L-9 L-10 L-11 L-12 L-13 L-14 L-15 L-16 L-17 L-18 L-19 L-20 L-21 L-22 L-23 L-24 L-25 L-26 L-27 L-28 L-29 L-30 L-31 L-32 L-33 L-34 L-35 L-36 L-37 L-38 L-39 L-40 L-41

L-42 L-43 L-44 L-45 L-46 L-47 L-48 L-49 L-50 L-51 L-52 L-53 L-54 L-55 L-56 L-57 L-58 L-59 L-60 L-61 L-62

LGP-1-12

FIGURE 11A

FIGURE 11B

FIGURE 11C

FIGURE 10

A A'

N

0 40 80
GRAPHIC SCALE IN FEET

LEGEND

TH-22	SOIL BORING
LGP-1-12	SOIL BORING (SEPT 2012)
MW-3/TH-8	MONITORING WELL
L-7	LIF/EC PROBE (MAR 2011)
L-56	LIF-EC PROBE (SEPT 2012)
GP-3	GEOPROBE
VAPOR PT. 1	VAPOR PROBE
A A'	CROSS SECTION LOCATION

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR REVIEW	CVE	APZ	2/27/14

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WENCK ASSOCIATES

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763.479.4242

PROJECT TITLE

PILOT TEST
FORMER UNION 76
CAMBRIDGE, MN

MILLE LACS OILS

SHEET TITLE

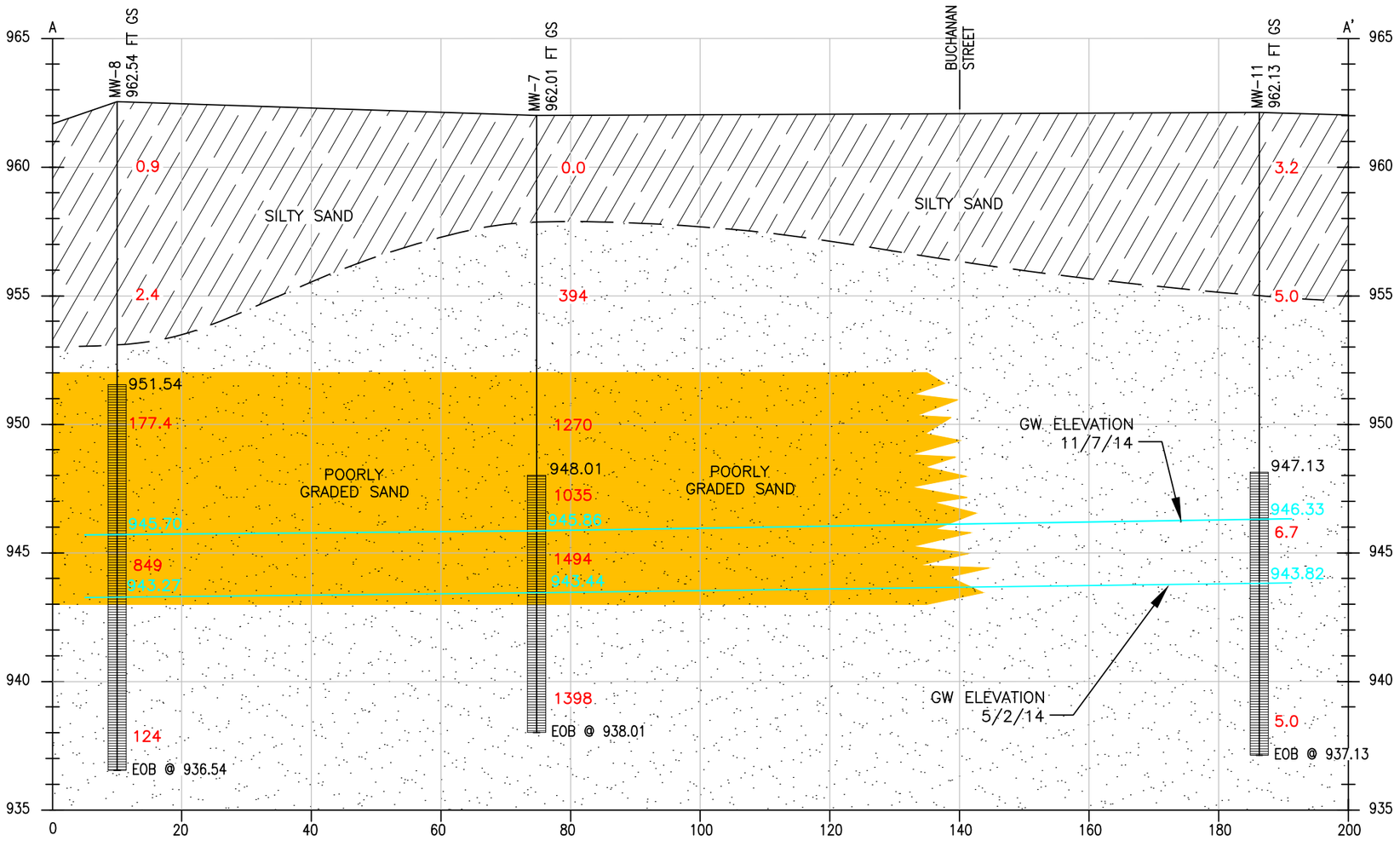
END POINTS OF
GEOLOGIC CROSS SECTIONS

DWN BY	CHK'D	APP'D	DWG DATE	FEB. 2016
CVE	AZ		SCALE	AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
3228-0009	FIGURE 9	

M:\3228\0009\xsec\Figure 3 - HISTORICAL SAMPLING LOCATIONS.DWG

Plot Date & Time:4 February 2016 11:44 AM



LEGEND

943.44	GROUNDWATER ELEVATION (ABOVE MSL)
1270	PID READING
	HISTORICAL LIGHT NON-AQUEOUS PHASE LIQUID (LNAPL) ZONE
	SILTY SAND
	POORLY GRADED SAND

HORIZONTAL SCALE: 1"=20 FT.
VERTICAL SCALE: 1"=5 FT.

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.
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MAPLE PLAIN, MN 55359
763.479.4200
763.479.4242

DWN BY	CHK'D	APP'D
CVE	AZ	

DWG DATE: FEB. 2016
SCALE: AS SHOWN

PROJECT: PILOT TEST
FORMER UNION 76, CAMBRIDGE, MN
CLIENT: MILLE LACS OIL

SHEET TITLE: CROSS SECTION A-A'

PROJECT NO.: 3228-0009
SHEET NO.: FIGURE 10
REV NO.:

M:\3228\0009\xsec\cross sec A-A.dwg

B

MW-11 963.94 FT GS

MW-6 962.61 FT GS

MW-6 962.65 FT GS

SILTY SAND

3.2

4.1

5.9

POORLY GRADED SAND

GW ELEVATION 11/7/14

GW ELEVATION 5/2/14

945.94

5.8

944.21

941.82

863

EOB @ 935.94

944.99

943.61

942.58

EOB @ 933.61

931.65

SILT

EOB @ 921.65

MATCHLINE SEE FIGURE 11B

HORIZONTAL SCALE: 1"=20 FT.
VERTICAL SCALE: 1"=5 FT.

965 960 955 950 945 940 935 930 925

0 20 40 60 80 110 120 140 160 180 200 220 240 260 280 300

LEGEND

943.44	GROUNDWATER ELEVATION (ABOVE MSL)
1270	PID READING
	HISTORICAL LIGHT NON-AQUEOUS PHASE LIQUID
	SILTY SAND
	POORLY GRADED SAND

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

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763.479.4200
763.479.4242

DWN BY	CHK'D	APP'D
CVE	AZ	

DWG DATE: FEB. 2016
SCALE: AS SHOWN

PROJECT: PILOT TEST WORKPLAN
FORMER UNION 76, CAMBRIDGE, MN

CLIENT: MILLE LACS OIL

SHEET TITLE: CROSS SECTION B-B'

PROJECT NO.: 3228-0009

SHEET NO.: FIGURE 11A

REV NO.:

Plot Date & Time:4 February 2016 11:45 AM

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Plot Date & Time:4 February 2016 11:45 AM

MW-9
961.89
FT GS

MW-7
962.01
FT GS

SILTY SAND

SILTY SAND

1.9

0.0

394

1.2

950.89

1270

948.01

MATCHLINE
SEE FIGURE 11A

MATCHLINE
SEE FIGURE 11C

POORLY
GRADED SAND

POORLY
GRADED SAND

GW ELEVATION
11/7/14

3:3

945.26

1135

945.86

943.20

1511

943.44

1494

GW ELEVATION
5/2/14

1398

EOB @ 935.89

EOB @ 938.01

SILT / CLAY

965
960
955
950
945
940
935
930
925

300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600

LEGEND

943.44 GROUNDWATER ELEVATION (ABOVE MSL)

1270 PID READING

HISTORICAL LIGHT NON-AQUEOUS PHASE LIQUID

SILTY SAND

POORLY GRADED SAND

HORIZONTAL SCALE: 1"=20 FT.
VERTICAL SCALE: 1"=5 FT.

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.
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MAPLE PLAIN, MN 55359
763.479.4200
763.479.4242

DWN BY	CHK'D	APP'D
CVE	AZ	

DWG DATE: FEB. 2016
SCALE: AS SHOWN

PROJECT: PILOT TEST
FORMER UNION 76, CAMBRIDGE, MN
CLIENT: MILLE LACS OIL

SHEET TITLE: CROSS SECTION B–B'

PROJECT NO.: 3228–0009
SHEET NO.: FIGURE 11B
REV NO.:

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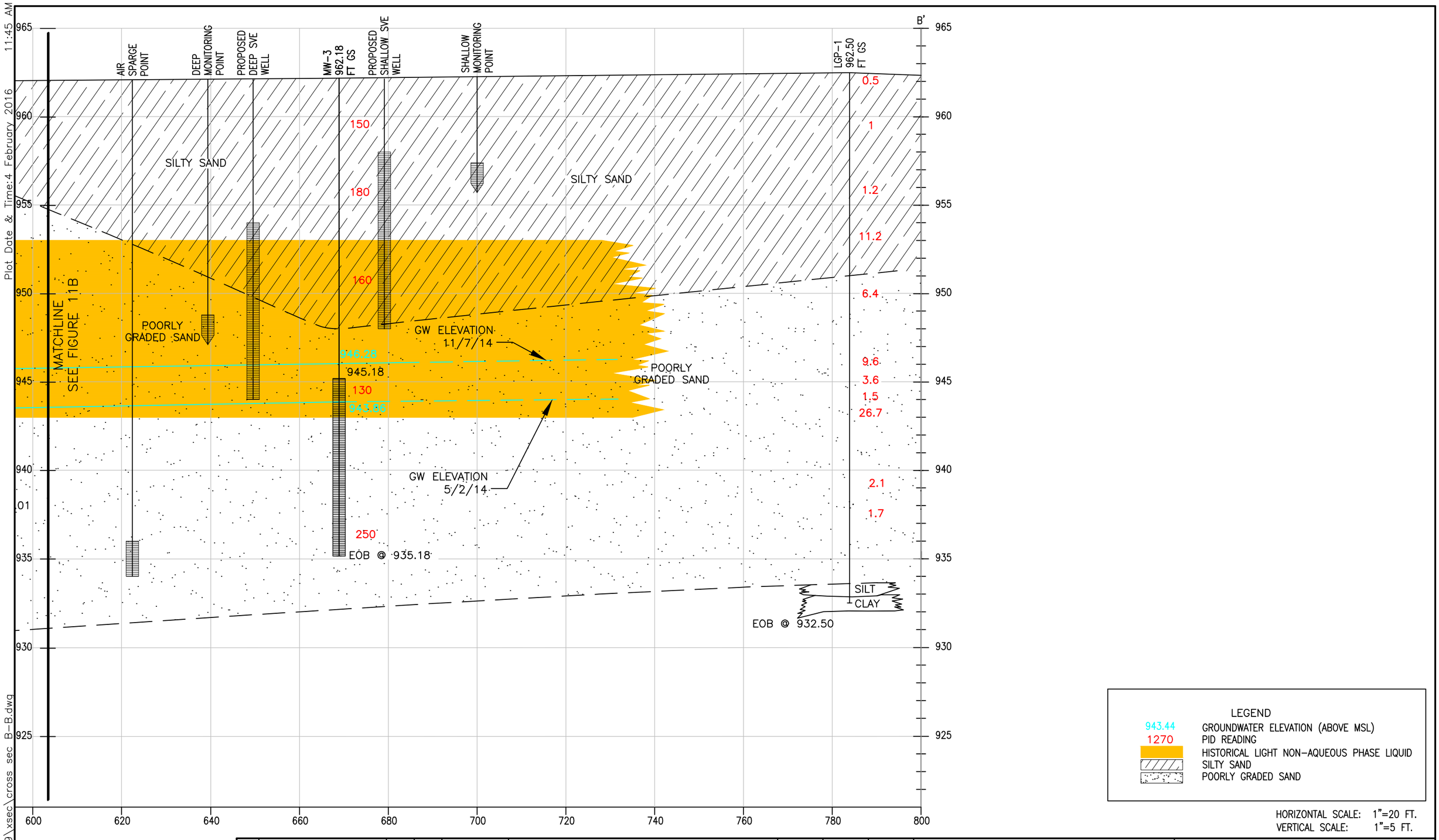

LEGEND

943.44 GROUNDWATER ELEVATION (ABOVE MSL)

1270 PID READING

HISTORICAL LIGHT NON-AQUEOUS PHASE LIQUID

SILTY SAND

POORLY GRADED SAND

HORIZONTAL SCALE: 1"=20 FT.
VERTICAL SCALE: 1"=5 FT.

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

WENCK ASSOCIATES
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MAPLE PLAIN, MN 55359
763.479.4200
763.479.4242

DWN BY	CHK'D	APP'D
CVE	AZ	

DWG DATE: FEB. 2016
SCALE: AS SHOWN

PROJECT: PILOT TEST
FORMER UNION 76, CAMBRIDGE, MN
CLIENT: MILLE LACS OIL

SHEET TITLE: CROSS SECTION B-B'

PROJECT NO. 3228-0009
SHEET NO. FIGURE 11C
REV NO.

Plot Date & Time:4 February 2016 11:45 AM
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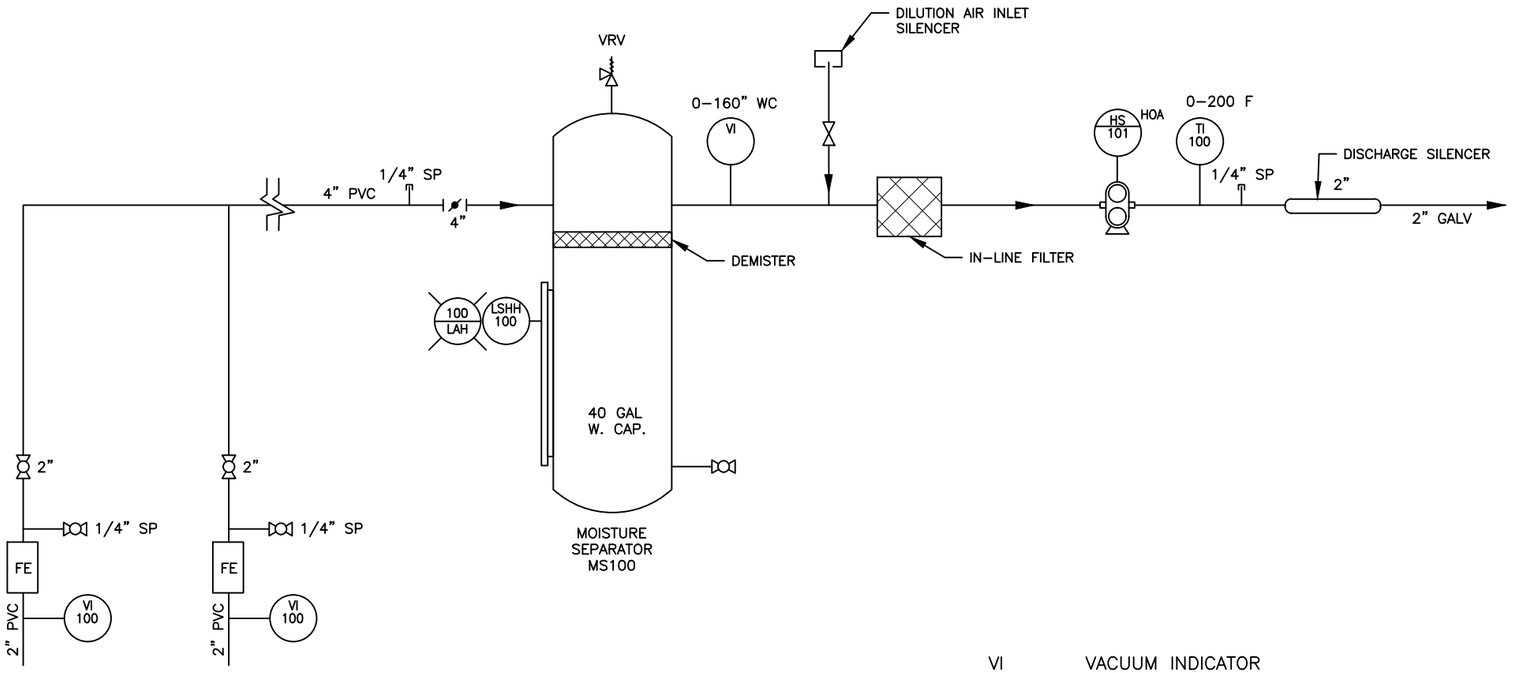
Plot Date & Time:4 February 2016 11:44 AM



VI	VACUUM INDICATOR
PI	PRESSURE INDICATOR
LAH	LEVEL ALARM HIGH
LSHH	LEVEL SWITCH HIGH HIGH
VRV	VACCUM RELIEF VALVE
DPI	DIFFERENTIAL PRESSURE INDICATOR
FE	FLOW ELEMENT (PITOT TUBE)
HS	HAND SWITCH (THIS IS LOCATED ON THE PANEL)
HOA	HAND/OFF/AUTO SWITCH
TI	TEMPERATURE INDICATOR

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.
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MAPLE PLAIN, MN 55359
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763.479.4242

DWN BY	CHK'D	APP'D
CVE	AZ	

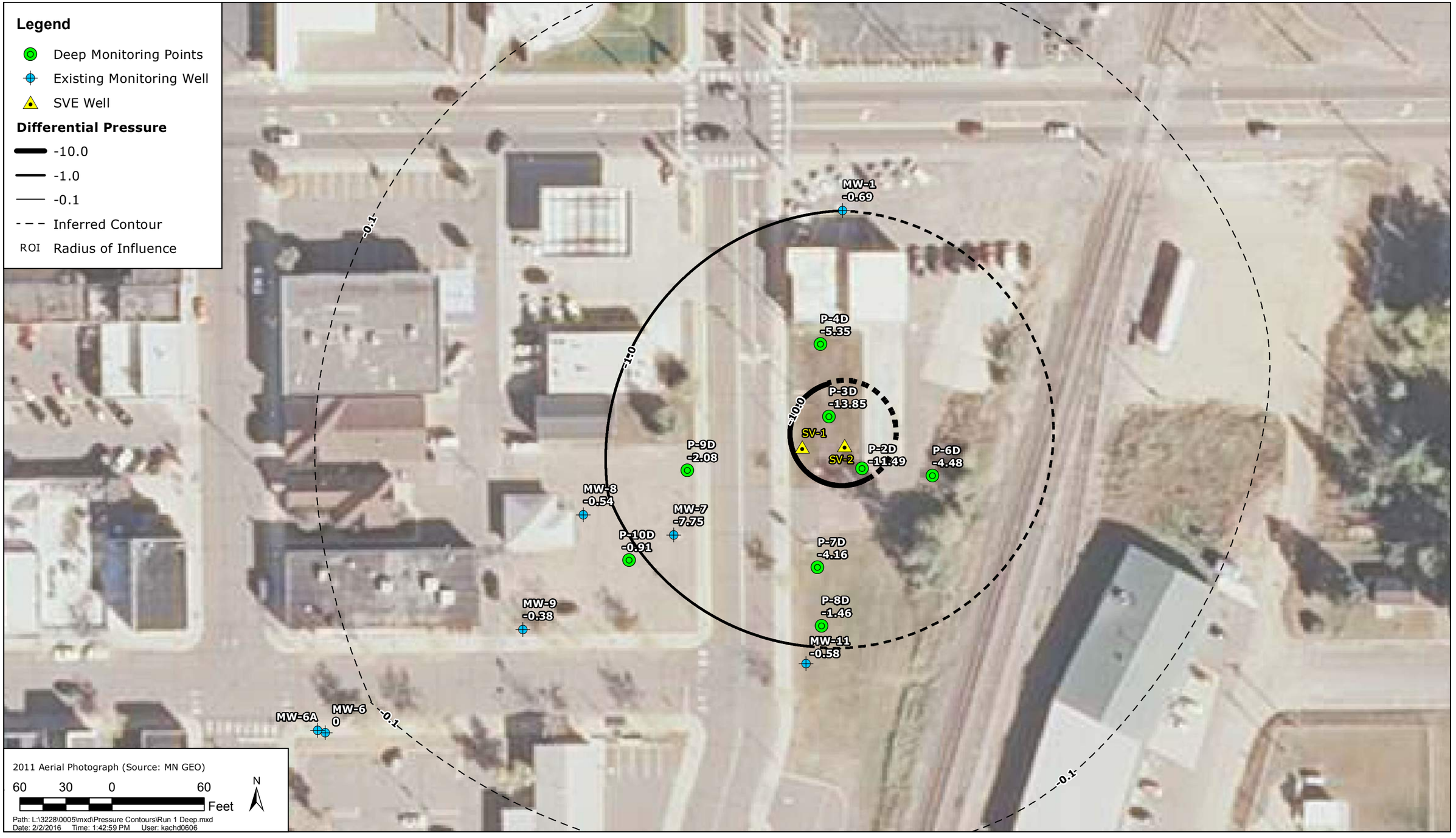
DWG DATE: FEB. 2016
SCALE: AS SHOWN

PROJECT: PILOT TEST
FORMER UNION 76, CAMBRIDGE, MN
CLIENT: MILLE LACS OIL

SHEET TITLE: PROCESS AND INSTRUMENTATION DIAGRAM

PROJECT NO.	SHEET NO.	REV NO.
3228–0009	FIGURE 12	

M:\3228\0009\PROCESS DIAGRAM.dwg



MILLE LACS OIL COMPANY

ROI Test #1 - Both SV-1 and SV-2

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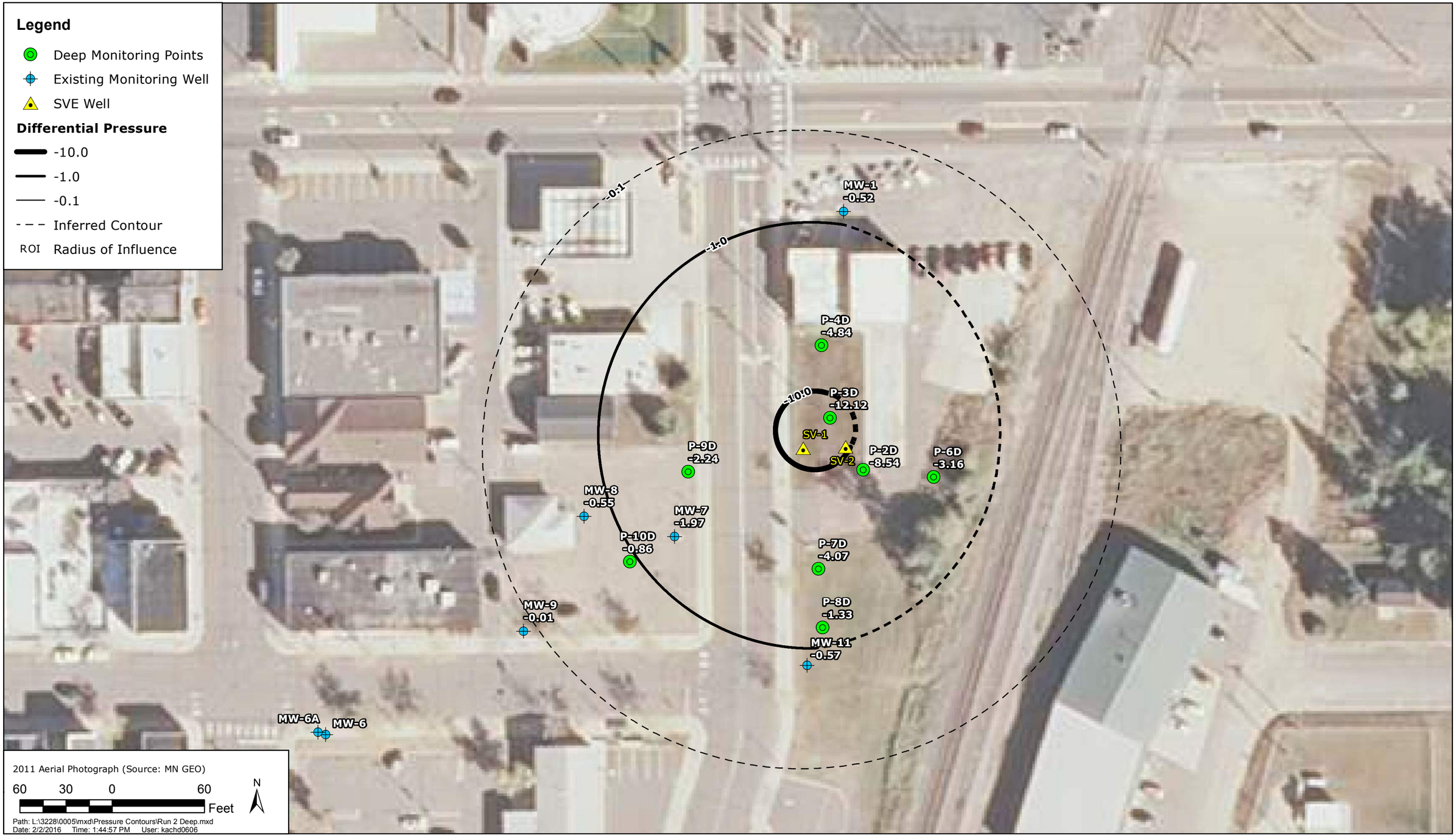
Responsive partner. Exceptional outcomes.

FEB 2016

Figure 13



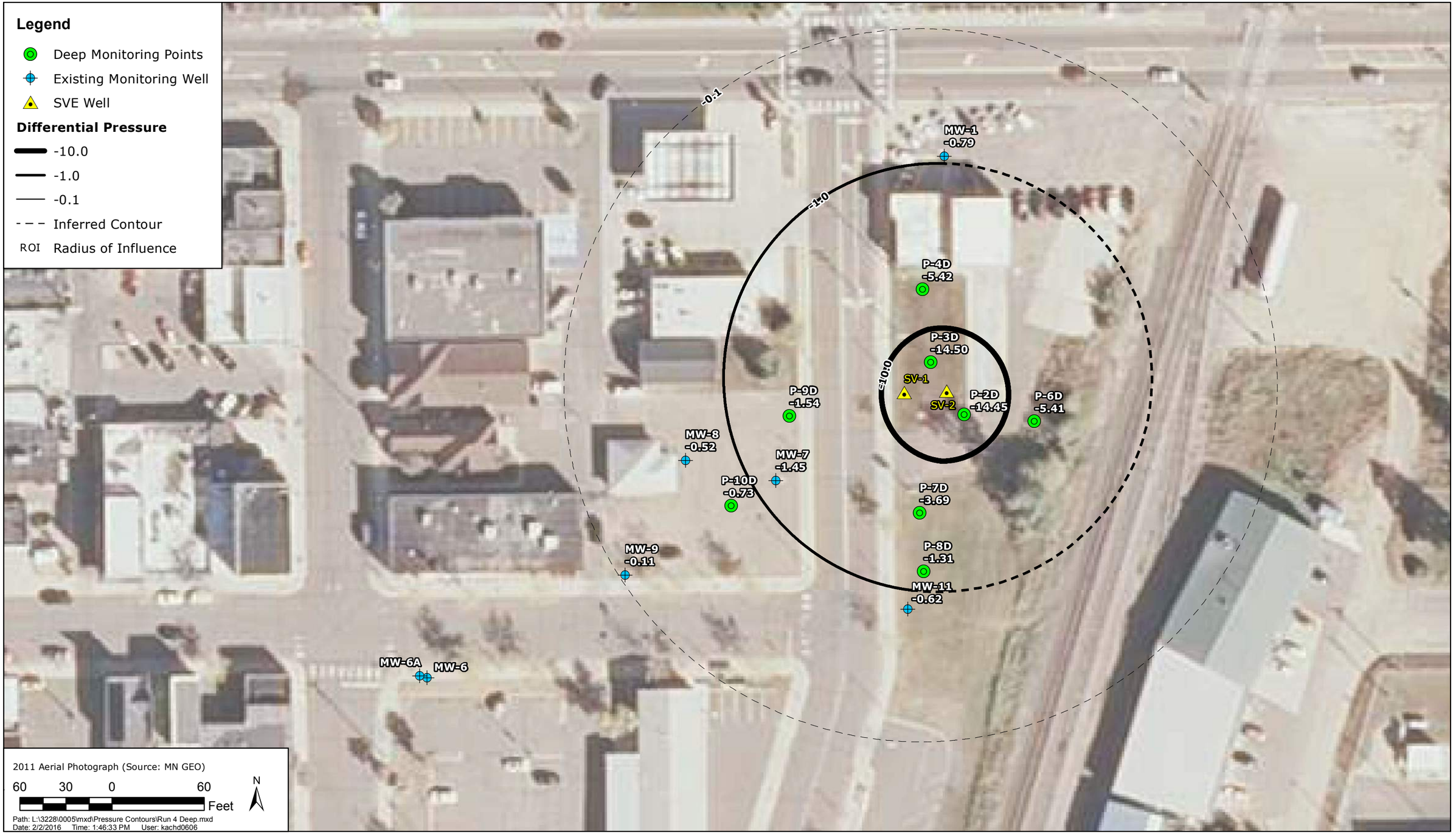
MILLE LACS OIL COMPANY

ROI Test #2 - SV-1 Only

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

FEB 2016

Figure 14



MILLE LACS OIL COMPANY

ROI Test #4 - SV-2 Only

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

FEB 2016

Figure 15

MILLE LACS OIL COMPANY	FEB 2016
ROI Test #5 - SV-1 Only with 50% Dilution Air	Figure 16

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

MILLE LACS OIL COMPANY

ROI Test #6 - SV-2 Only with 50% Dilution Air

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

FEB 2016

Figure 17

Tables

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Date	Run #	SVE-1 approx %	SVE-2 approx %	Time	Vacuum - Pre-manifold (SV-1) (in H2O)	Vacuum - Pre-manifold (SV-2) (in H2O)	Total Vacuum Post-Moisture Separator (in H2O)	SV-1 Velocity FPM	SV-1 Airflow (SFM)	SV-2 Velocity FPM	SV-2 Airflow (SFM)	Stack Temp (F)	PID Reading Effluent (ppm)	TO-15 Sample Collected	Dilution Air approx %	Notes
11/16/2015	1	100	100	12:21:00 PM	NA*	NA*	-19	NA*	NA*	NA*	NA*	NA*	906		0	NA*- H2K Installed Gauges not working properly
11/16/2015		100	100	12:52:00 PM	NA*	NA*	-25	NA*	NA*	NA*	NA*	NA*	1070	**E-1**	0	NA*- H2K Installed Gauges not working properly
11/16/2015		100	100	1:45:00 PM	-20.6	-20.6	-25	700	34	1140	55	65	1010		0	Switched to hand measurements with fluke
11/16/2015		100	100	2:35:00 PM	-22.8	-22.5	-22.5	1100	40	1415	69	70	1025		0	
11/16/2015		100	100	3:22:00 PM	-31.1	-32.2	-29	1200	55	1880	75	72	1126		0	
11/16/2015		100	100	4:02:00 PM	-31.9	-31.9	-30	750	51	1065	59	70	1087		0	
11/17/2015	2	100	0	8:53:00 AM	-43.4	--	-40	1300	62	--	--	74	1100		0	
11/17/2015		100	0	9:54:00 AM	-50.5	--	-41	1132	57	--	--	76	945		0	
11/17/2015		100	0	10:35:00 AM	-51.5	--	-49	1128	55	--	--	83	977		0	
11/17/2015		100	0	11:33:00 AM	-50.3	--	-45	1147	56	--	--	85	978		0	
11/17/2015		100	0	12:57:00 PM	-51	--	-50	1135	55	--	--	80	1498		0	
11/17/2015	3	100	100	1:18:00 PM	-37	-37.4	-32	760	36	1400	86	75	1216	**E-2**	0	1:02 PM - Opened both wells for TO-15 sample

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

11/17/2015	4	0	100	1:26:00 PM	--	-51.6	-49	--	--	1300	58	80	1104		0	
11/17/2015		0	100	2:08:00 PM	--	-53.5	-50	--	--	1376	60	82	1036		0	
11/17/2015		0	100	12:00:00 AM	--	-54.4	-50	--	--	1270	61	77	939		0	
11/17/2015		0	100	3:32:00 PM	--	-53.8	-50	--	--	1149	57	80	1066		0	
11/18/2015	5	100	0	8:50:00 AM	-25	--	-23	806	37	--	--	72	1250		50	Tweaked dilution air valve to keep vacuum @ -25(in H20)
11/18/2015		100	0	9:44:00 AM	-25	--	-22	750	31	--	--	73	1437		50	Tweaked dilution air valve to keep vacuum @ -25(in H20)
11/18/2015		100	0	10:30:00 AM	-25	--	-23	950	51	--	--	73	1452		50	Tweaked dilution air valve to keep vacuum @ -25(in H20)
11/18/2015		100	0	11:25:00 AM	-25	--	-21	900	45	--	--	73	1455		50	Tweaked dilution air valve to keep vacuum @ -25(in H20)
11/18/2015	6	0	100	11:55:00 AM	--	-26.5	--	--	--	--	--	--	--		50	Set vacuum to -26.5(in H20) then waited appx 1 hour for system to equilibrate.
11/18/2015		0	100	1:21:00 PM	--	-26.8	-22	--	--	929	46	74	1313		50	Vac - SV-2 -27.5(in H20) - Opened dilution to get to -26.8(in H20)
11/18/2015		0	100	2:20:00 PM	--	-27	-22	--	--	862	43	73	1372		50	
11/18/2015		0	100	2:55:00 PM	--	-27.9	-22.5	--	--	815	43	73	1460		50	
11/18/2015		0	100	3:33:00 PM	--	-28	-23	--	--	820	42	70	1487		50	
11/18/2015	7	100	100	4:00:00 PM	-33	-33	-31.5	946	47	883	44	74	1699	**E-3**	0	Opened both wells for TO-15 sample

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run #			B4 Startup							
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	9:48:00 AM	0.00						
P-1S	29	40	9:50:00 AM	0.11						
P-2S	42	18	9:45:00 AM	-0.03						
P-2D	42	18	9:45:00 AM	0.02						
P-3S	27	21	9:55:00 AM	0.05						
P-3D	27	21	9:55:00 AM	0.04						
P-4D	70	70	10:00:00 AM	0.02						
P-5S	151	149	10:05:00 AM	0.03						
MW-1	157	155	10:10:00 AM	0.05						
P-6D	87	61	10:12:00 AM	0.05						
P-7S	78	81	10:15:00 AM	-0.07						
P-7D	78	81	10:15:00 AM	0.08						
P-8D	116	117	10:20:00 AM	0.14						
MW-11	140	144	10:22:00 AM	0.09						
P-9S	76	104	10:25:00 AM	0.05						
P-9D	76	104	10:25:00 AM	0.10						
P-10S	134	158	10:30:00 AM	0.09						
P-10D	134	158	10:30:00 AM	0.09						
MW-7	101	126	10:45:00 AM	0.13						
MW-8	149	176	10:50:00 AM	0.11						
MW-9	217	241	11:45:00 AM	0.08						
MW-6	362	386	11:00:00 AM	0.03						
MW-6A	365	393	11:00:00 AM	0.01						
MW-10	522	552	11:15:00 AM	0.01						

Notes:

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 1 Shallow

Monitoring Point ID	Distance from SV-1 (ft.)	Distance from SV-2 (ft.)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)
P-1S	29	40	12:51 PM	-4.54	2:06 PM	-4.90	3:01:00 PM	-5.62	3:42 PM	-5.75	4:11 PM	-5.02
P-2S	42	18	12:52 PM	-8.31	2:07 PM	-9.12	3:03:00 PM	-11.34	3:43 PM	-11.43	4:11 PM	-10.87
P-3S	27	21	12:53 PM	-2.51	2:10 PM	-0.42	3:05:00 PM	0.10	3:45 PM	-0.32	4:15 PM	-0.33
P-5S	151	149	12:55 PM	-0.11	2:15 PM	-0.51	3:09:00 PM	-0.59	3:48 PM	-0.25	4:20 PM	-0.25
P-7S	78	81	12:58 PM	-1.49	2:17 PM	-2.10	3:15:00 PM	-2.43	3:52 PM	-2.57	4:26 PM	-2.42
P-9S	76	104	1:05 PM	-0.72	2:22 PM	-0.60	3:20:00 PM	-0.80	3:54 PM	-0.79	4:30 PM	-0.79
P-10S	134	158	1:06 PM	-0.50	2:24 PM	-0.47	3:23:00 PM	-0.62	3:56 PM	-0.63	4:32 PM	-0.63

Notes: Shallow Monitoring Points Only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 1 Deep												
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	12:50:00 PM	0.00	2:05:00 PM	-0.05	3:00:00 PM	-0.43	3:41:00 PM	-0.02	4:09:00 PM	-0.05
P-2D	42	18	12:52:00 PM	-8.78	2:08:00 PM	-9.77	3:03:00 PM	-11.96	3:44:00 PM	-12.01	4:11:00 PM	-11.49
P-3D	27	21	12:53:00 PM	-11.40	2:12:00 PM	-12.05	3:06:00 PM	-14.10	3:46:00 PM	-14.16	4:17:00 PM	-13.85
P-4D	70	70	12:54:00 PM	-3.61	2:13:00 PM	-4.24	3:08:00 PM	-5.30	3:46:00 PM	-5.47	4:18:00 PM	-5.35
MW-1	157	155	12:56:00 PM	-0.32	2:14:00 PM	-0.18	3:10:00 PM	-0.18	3:48:00 PM	-0.80	4:21:00 PM	-0.69
P-6D	87	61	12:57:00 PM	-3.38	2:16:00 PM	-3.68	3:12:00 PM	-4.23	3:50:00 PM	-4.55	4:25:00 PM	-4.48
P-7D	78	81	12:58:00 PM	-3.12	2:19:00 PM	-3.43	3:16:00 PM	-4.14	3:53:00 PM	-4.24	4:27:00 PM	-4.16
P-8D	116	117	1:00:00 PM	-1.03	2:21:00 PM	-1.11	3:18:00 PM	-1.42	3:53:00 PM	-1.49	4:28:00 PM	-1.46
MW-11	140	144	1:01:00 PM	-0.42	2:20:00 PM	-0.48	3:19:00 PM	-0.66	3:54:00 PM	-0.57	4:29:00 PM	-0.58
P-9D	76	104	1:05:00 PM	-1.80	2:23:00 PM	-1.68	3:21:00 PM	-2.08	3:55:00 PM	-2.14	4:30:00 PM	-2.08
P-10D	134	158	1:06:00 PM	-0.76	2:25:00 PM	-0.65	3:24:00 PM	-0.90	3:57:00 PM	-0.91	4:32:00 PM	-0.91
MW-7	101	126	1:10:00 PM	-1.42	2:26:00 PM	-1.50	3:25:00 PM	-1.84	3:56:00 PM	-1.78	4:31:00 PM	-1.75
MW-8	149	176	1:11:00 PM	-0.44	2:27:00 PM	-0.32	3:26:00 PM	-0.67	3:58:00 PM	-0.55	4:32:00 PM	-0.54
MW-9	217	241	1:12:00 PM	-0.02	2:29:00 PM	-0.60	3:27:00 PM	-0.11	3:59:00 PM	-0.43	4:35:00 PM	-0.38
MW-6	362	386	1:13:00 PM	0.03	2:30:00 PM	0.03	3:30:00 PM	-0.51	4:00:00 PM	0.00	4:40:00 PM	0.00
MW-6A	365	393	1:13:00 PM	0.01								
MW-10	522	552	1:14:00 PM	0.01								

Notes: Deep monitoring points only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 2 Shallow

Monitoring Point ID	Distance from SV-1 (ft.)	Distance from SV-2 (ft.)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)
P-1S	29	40	9:24:00 AM	-5.08	10:15:00 AM	-5.17	11:08:00 AM	-5.22	12:35:00 PM	-5.42
P-2S	42	18	9:26:00 AM	-6.71	10:15:00 AM	-7.83	11:09:00 AM	-8.12	12:36:00 PM	-8.24
P-3S	27	21	9:28:00 AM	-0.13	10:17:00 AM	-0.20	11:10:00 AM	0.10	12:38:00 PM	-0.80
P-5S	151	149	9:31:00 AM	-0.11	10:19:00 AM	-0.20	11:13:00 AM	-0.19	12:42:00 PM	-0.20
P-7S	78	81	9:35:00 AM	-1.23	10:21:00 AM	-1.59	11:16:00 AM	-3.31	12:45:00 PM	-3.30
P-9S	76	104	9:39:00 AM	-0.73	10:24:00 AM	-0.84	11:20:00 AM	-0.83	12:49:00 PM	-0.86
P-10S	134	158	9:41:00 AM	-0.48	10:27:00 AM	-0.60	11:22:00 AM	-0.55	12:51:00 PM	-0.56

Notes: Shallow monitoring points only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 2 Deep										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	9:23:00 AM	0.00	10:14:00 AM	0.00	11:07:00 AM	0.01	12:34:00 PM	0.00
P-2D	42	18	9:27:00 AM	-7.05	10:16:00 AM	-8.16	11:09:00 AM	-8.44	12:37:00 PM	-8.54
P-3D	27	21	9:29:00 AM	-10.59	10:17:00 AM	-11.68	11:11:00 AM	-11.98	12:40:00 PM	-12.12
P-4D	70	70	9:30:00 AM	-3.78	10:18:00 AM	-4.57	11:12:00 AM	-4.76	12:41:00 PM	-4.84
MW-1	157	155	9:32:00 AM	-0.32	10:19:00 AM	-0.51	11:14:00 AM	-0.51	12:43:00 PM	-0.52
P-6D	87	61	9:34:00 AM	-2.56	10:20:00 AM	-3.03	11:15:00 AM	-3.17	12:44:00 PM	-3.16
P-7D	78	81	9:36:00 AM	-3.44	10:21:00 AM	-3.95	11:17:00 AM	-4.04	12:47:00 PM	-4.07
P-8D	116	117	9:37:00 AM	-1.07	10:22:00 AM	-1.33	11:18:00 AM	-1.33	12:48:00 PM	-1.33
MW-11	140	144	9:38:00 AM	-0.47	10:22:00 AM	-0.61	11:19:00 AM	-0.60	12:49:00 PM	-0.57
P-9D	76	104	9:40:00 AM	-1.93	10:24:00 AM	-2.20	11:21:00 AM	-2.21	12:50:00 PM	-2.24
P-10D	134	158	9:42:00 AM	-0.73	10:27:00 AM	-0.89	11:22:00 AM	-0.84	12:52:00 PM	-0.86
MW-7	101	126	9:43:00 AM	-1.68	10:26:00 AM	-1.98	11:23:00 AM	-1.98	12:51:00 PM	-1.97
MW-8	149	176	9:44:00 AM	-0.47	10:28:00 AM	-0.55	11:24:00 AM	-0.55	12:53:00 PM	-0.55
MW-9	217	241	9:45:00 AM	-0.03	10:29:00 AM	-0.04	11:25:00 AM	-0.02	12:54:00 PM	-0.01
MW-6	362	386	9:46:00 AM	0.03	10:30:00 AM	0.03	--	--	--	--
MW-6A	365	393	--	--	--	--	--	--	--	--
MW-10	522	552	--	--	--	--	--	--	--	--

Notes: Deep monitoring points only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 4 Shallow							
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Differential Pressure Reading (in WC)**
P-1S	29	40	1:38:00 PM	-3.46	2:30:00 PM	-3.26	-3.17
P-2S	42	18	1:39:00 PM	-13.20	2:32:00 PM	-13.78	-13.74
P-3S	27	21	1:42:00 PM	-0.88	2:34:00 PM	-0.94	-0.84
P-5S	151	149	1:45:00 PM	-0.20	2:39:00 PM	-0.21	-0.31
P-7S	78	81	1:53:00 PM	-2.93	2:42:00 PM	-2.89	-3.57
P-9S	76	104	1:56:00 PM	-0.56	2:50:00 PM	-0.57	-0.61
P-10S	134	158	1:57:00 PM	-0.44	2:53:00 PM	-0.45	-0.51

Notes: Shallow monitoring points only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 4 Deep								
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	1:37:00 PM	0.00	2:29:00 PM	0.00	3:10:00 PM	0.00
P-2D	42	18	1:40:00 PM	-13.97	2:33:00 PM	-14.56	3:12:00 PM	-14.45
P-3D	27	21	1:43:00 PM	-14.16	2:36:00 PM	-14.60	3:14:00 PM	-14.50
P-4D	70	70	1:44:00 PM	-5.07	2:37:00 PM	-5.26	3:15:00 PM	-5.42
MW-1	157	155	1:46:00 PM	-0.56	2:40:00 PM	-0.58	3:16:00 PM	-0.79
P-6D	87	61	1:47:00 PM	-4.97	2:41:00 PM	-5.29	3:17:00 PM	-5.41
P-7D	78	81	1:53:00 PM	-3.58	2:43:00 PM	-3.57	3:20:00 PM	-3.69
P-8D	116	117	1:54:00 PM	-1.21	2:47:00 PM	-1.21	3:21:00 PM	-1.31
MW-11	140	144	1:55:00 PM	-0.55	2:48:00 PM	-0.54	3:22:00 PM	-0.62
P-9D	76	104	1:56:00 PM	-1.47	2:51:00 PM	-1.45	3:24:00 PM	-1.54
P-10D	134	158	1:57:00 PM	-0.64	2:53:00 PM	-0.63	3:25:00 PM	-0.73
MW-7	101	126	1:58:00 PM	-1.38	2:52:00 PM	-1.37	3:26:00 PM	-1.45
MW-8	149	176	1:59:00 PM	-0.45	2:54:00 PM	-0.42	3:27:00 PM	-0.52
MW-9	217	241	2:00:00 PM	0.04	2:55:00 PM	-0.01	3:28:00 PM	-0.11
MW-6	362	386	2:02:00 PM	0.08				
MW-6A	365	393	--	--				
MW-10	522	552	--	--				

Notes: Deep monitoring points only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 5 Shallow

Monitoring Point ID	Distance from SV-1 (ft.)	Distance from SV-2 (ft.)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)
P-1S	29	40	9:17:00 AM	0.43	10:07:00 AM	0.30	10:57:00 AM	0.38	11:28:00 AM	0.20
P-2S	42	18	9:18:00 AM	-1.38	10:08:00 AM	-2.21	10:58:00 AM	-2.42	11:29:00 AM	-2.44
P-3S	27	21	9:19:00 AM	-0.03	10:10:00 AM	-0.13	11:01:00 AM	-0.20	11:30:00 AM	-0.20
P-5S	151	149	9:21:00 AM	-0.04	10:13:00 AM	-0.10	11:04:00 AM	-0.06	11:34:00 AM	-0.06
P-7S	78	81	9:27:00 AM	-0.01	10:16:00 AM	0.21	11:06:00 AM	0.74	11:36:00 AM	0.15
P-9S	76	104	9:32:00 AM	-0.38	10:21:00 AM	-0.47	11:12:00 AM	-0.40	11:40:00 AM	-0.43
P-10S	134	158	9:34:00 AM	-0.23	10:23:00 AM	-0.38	11:13:00 AM	-0.26	11:42:00 AM	-0.29

Notes: Shallow monitoring points only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 5 Deep										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	9:16:00 AM	0.05	10:06:00 AM	0.03	10:57:00 AM	-0.07	11:27:00 AM	-0.07
P-2D	42	18	9:18:00 AM	-3.70	10:09:00 AM	-4.45	11:00:00 AM	-4.57	11:29:00 AM	-4.51
P-3D	27	21	9:19:00 AM	-5.60	10:11:00 AM	-6.33	11:02:00 AM	-6.43	11:30:00 AM	-6.35
P-4D	70	70	9:20:00 AM	-2.04	10:12:00 AM	-2.69	11:03:00 AM	-2.61	11:32:00 AM	-2.59
MW-1	157	155	9:22:00 AM	-0.15	10:14:00 AM	-0.31	11:04:00 AM	-0.24	11:34:00 AM	-0.22
P-6D	87	61	9:25:00 AM	-1.39	10:15:00 AM	-1.75	11:05:00 AM	-1.77	11:35:00 AM	-1.75
P-7D	78	81	9:28:00 AM	-1.85	10:17:00 AM	-2.22	11:07:00 AM	-2.21	11:37:00 AM	-2.19
P-8D	116	117	9:30:00 AM	-0.63	10:19:00 AM	-0.82	11:10:00 AM	-0.78	11:38:00 AM	-0.78
MW-11	140	144	9:31:00 AM	-0.26	10:20:00 AM	-0.35	11:11:00 AM	-0.35	11:39:00 AM	-0.32
P-9D	76	104	9:33:00 AM	-1.02	10:22:00 AM	-1.26	11:12:00 AM	-1.10	11:40:00 AM	-1.20
P-10D	134	158	9:35:00 AM	-0.39	10:24:00 AM	-0.54	11:13:00 AM	-0.38	11:42:00 AM	-0.47
MW-7	101	126	9:36:00 AM	-0.86	10:23:00 AM	-1.08	11:14:00 AM	-0.79	11:41:00 AM	-0.92
MW-8	149	176	9:37:00 AM	-0.25	10:25:00 AM	-0.37	11:14:00 AM	-0.26	11:43:00 AM	-0.26
MW-9	217	241	9:38:00 AM	-0.02	10:26:00 AM	-0.03	11:15:00 AM	0.03	11:44:00 AM	-0.03
MW-6	362	386								
MW-6A	365	393								
MW-10	522	552								

Notes: Deep monitoring points only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 6 Shallow

Monitoring Point ID	Distance from SV-1 (ft.)	Distance from SV-2 (ft.)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)
P-1S	29	40	12:55:00 PM	0.33	1:54:00 PM	0.30	2:30:00 PM	0.29	3:12:00 PM	0.40
P-2S	42	18	12:56:00 PM	-2.64	1:55:00 PM	-2.62	2:31:00 PM	-2.51	3:13:00 PM	-2.50
P-3S	27	21	12:58:00 PM	-0.15	1:56:00 PM	-0.14	2:33:00 PM	-0.13	3:14:00 PM	-0.09
P-5S	151	149	1:00:00 PM	-0.38	2:00:00 PM	-0.07	2:36:00 PM	-0.07	3:18:00 PM	-0.80
P-7S	78	81	1:03:00 PM	0.55	2:04:00 PM	0.20	2:40:00 PM	0.07	3:21:00 PM	0.11
P-9S	76	104	1:08:00 PM	-0.61	2:08:00 PM	-0.28	2:43:00 PM	-0.24	3:25:00 PM	-0.29
P-10S	134	158	1:10:00 PM	-0.49	2:10:00 PM	-0.25	2:44:00 PM	-0.19	3:26:00 PM	-0.24

Notes: Shallow monitoring points only

Table 1
Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 6 Deep										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	12:54:00 PM	-0.04	1:54:00 PM	-0.05	2:29:00 PM	0.31	3:12:00 PM	-0.06
P-2D	42	18	12:57:00 PM	-7.38	1:56:00 PM	-7.31	2:32:00 PM	-6.96	3:13:00 PM	-7.00
P-3D	27	21	12:58:00 PM	-7.44	1:57:00 PM	-7.32	2:33:00 PM	-6.95	3:15:00 PM	-6.99
P-4D	70	70	12:59:00 PM	-2.74	1:59:00 PM	-2.87	2:34:00 PM	-2.65	3:16:00 PM	-2.74
MW-1	157	155	1:01:00 PM	-0.62	2:01:00 PM	-0.33	2:37:00 PM	-0.31	3:19:00 PM	-0.35
P-6D	87	61	1:02:00 PM	-3.11	2:03:00 PM	-2.84	2:38:00 PM	-2.75	3:20:00 PM	-2.77
P-7D	78	81	1:04:00 PM	-2.17	2:04:00 PM	-1.90	2:41:00 PM	-1.83	3:22:00 PM	-1.90
P-8D	116	117	1:05:00 PM	-0.94	2:05:00 PM	-0.72	2:42:00 PM	-0.67	3:23:00 PM	-0.74
MW-11	140	144	1:07:00 PM	-0.55	2:06:00 PM	-0.31	2:42:00 PM	-0.28	3:23:00 PM	-0.34
P-9D	76	104	1:09:00 PM	-1.08	2:09:00 PM	-0.79	2:43:00 PM	-0.71	3:25:00 PM	-0.77
P-10D	134	158	1:10:00 PM	-0.59	2:11:00 PM	-0.35	2:44:00 PM	-0.30	3:27:00 PM	-0.38
MW-7	101	126	1:11:00 PM	-0.97	2:09:00 PM	-0.60	2:45:00 PM	-0.55	3:26:00 PM	-0.63
MW-8	149	176	1:12:00 PM	-0.56	2:15:00 PM	-0.33	2:46:00 PM	-0.17	3:27:00 PM	-0.24
MW-9	217	241	1:13:00 PM	-0.30	2:12:00 PM	-0.03	2:47:00 PM	-0.02	3:28:00 PM	-0.05
MW-6	362	386	1:14:00 PM	-0.29	2:13:00 PM	-0.05	2:48:00 PM	0.02	3:29:00 PM	-0.03
MW-6A	365	393								
MW-10	522	552								

Notes: Deep monitoring points only

Table 2
Effluent Analytical Summary
Former Union 76
Mille Lacs Oil
Cambridge, MN

Parameter	Method	Matrix	Units	CAS	E-1	E-2	E-3
Method TO-15							
1,2,4-Trimethylbenzene	TO-15	Air	ug/m3	95-63-6	**104000**	**245000**	**147000**
1,3,5-Trimethylbenzene	TO-15	Air	ug/m3	108-67-8	**67700**	**118000**	**81700**
4-Ethyltoluene	TO-15	Air	ug/m3	622-96-8	**69100**	**113000**	**79800**
Benzene	TO-15	Air	ug/m3	71-43-2	**3690000**	**3780000**	**4050000**
Cyclohexane	TO-15	Air	ug/m3	110-82-7	**14400000**	**15300000**	**15800000**
Ethylbenzene	TO-15	Air	ug/m3	100-41-4	**482000**	**678000**	**626000**
Methylene Chloride	TO-15	Air	ug/m3	75-09-2	**167000**	**187000**	**198000**
Toluene	TO-15	Air	ug/m3	108-88-3	**3260000**	**3340000**	**4290000**
m&p-Xylene	TO-15	Air	ug/m3	179601-23-1	**1660000**	**2450000**	**2070000**
n-Heptane	TO-15	Air	ug/m3	142-82-5	**4690000**	**5180000**	**5380000**
n-Hexane	TO-15	Air	ug/m3	110-54-3	**11100000**	**11300000**	**11700000**
o-Xylene	TO-15	Air	ug/m3	95-47-6	**459000**	**735000**	<31400

Notes:

BOLD	= The analyte has a detection at a quantifiable numerical value
Un-BOLD	= The analyte was not detected at or above the adjusted Method Detection Limit (MDL)

Only detected compounds are shown

Table 3
Total VOCs
Former Union 76
Mille Lacs Oil
Cambridge, MN

Parameter	Method	Matrix	Units	CAS	E-1	% of VOCs	E-2	% of VOCs	E-3	% of VOCs
Method TO-15										
1,2,4-Trimethylbenzene	TO-15	Air	ug/m3	95-63-6	104,000	0.26%	245,000	0.56%	147,000	0.33%
1,3,5-Trimethylbenzene	TO-15	Air	ug/m3	108-67-8	67,700	0.17%	118,000	0.27%	81,700	0.18%
4-Ethyltoluene	TO-15	Air	ug/m3	622-96-8	69,100	0.17%	113,000	0.26%	79,800	0.18%
Benzene	TO-15	Air	ug/m3	71-43-2	3,690,000	9.19%	3,780,000	8.70%	4,050,000	9.11%
Cyclohexane	TO-15	Air	ug/m3	110-82-7	14,400,000	35.87%	15,300,000	35.23%	15,800,000	35.54%
Ethylbenzene	TO-15	Air	ug/m3	100-41-4	482,000	1.20%	678,000	1.56%	626,000	1.41%
Methylene Chloride	TO-15	Air	ug/m3	75-09-2	167,000	0.42%	187,000	0.43%	198,000	0.45%
Toluene	TO-15	Air	ug/m3	108-88-3	3,260,000	8.12%	3,340,000	7.69%	4,290,000	9.65%
m&p-Xylene	TO-15	Air	ug/m3	179601-23-1	1,660,000	4.13%	2,450,000	5.64%	2,070,000	4.66%
n-Heptane	TO-15	Air	ug/m3	142-82-5	4,690,000	11.68%	5,180,000	11.93%	5,380,000	12.10%
n-Hexane	TO-15	Air	ug/m3	110-54-3	11,100,000	27.65%	11,300,000	26.02%	11,700,000	26.32%
o-Xylene	TO-15	Air	ug/m3	95-47-6	459,000	1.14%	735,000	1.69%	31,300	0.07%
				Total VOCs	**40,148,800**		**43,426,000**		**44,453,800**	
				PID Reading	1,070		1,216		1,699	

Notes:
Detected comounds only

Appendix A

Waste Handling and Disposal Documents

Appendix B

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Appendix C

Boring Logs / Construction Diagrams

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

LOG OF Vent Well SV-1

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

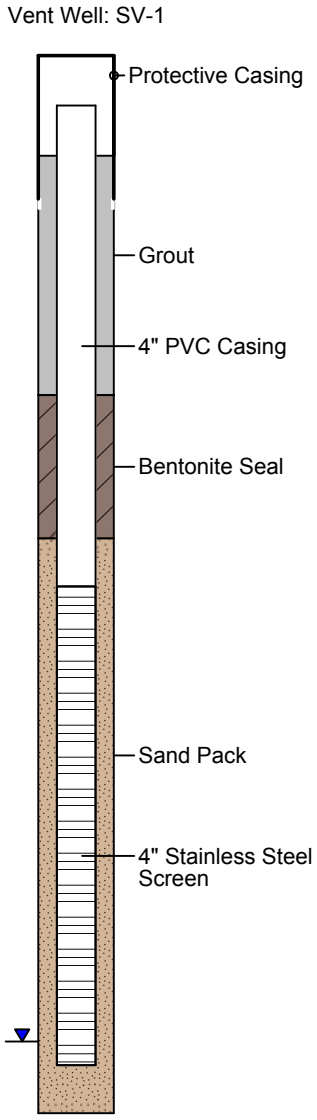
Project # B3228-0009

Dates (boring)	: 11/9/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/9/15	Driller	: Dusty Schroeder
Hole Diameter	: 10"	Driller Assistant	: Tucker
Drilling Method	: Push probe/HSA	Logged By	: Dan Larson
Sampling Method	: Macro Core	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

General Location:
Near Buchanon Street

Depth in Feet	Approx. Surf. Elev.962	USCS	GRAPHIC	DESCRIPTION	Sample	PID (PPM)	Soil Recovery (ft.)	GRAPHIC
0	962	ML		Grass Surface				
				Organic SILT (ML), dark brown, moist (Topsoil)				
		SM		SANDY SILT (SM), dark brown, medium stiff, moist		2226	3.3/5	
				SILTY SAND (SM), dark brown, medium dense wet 3-5'				
5	957	SM		moist to wet 5-7.5'				
						2925	3/5	
		SP		SAND, Poorly Graded (SP), gray-brown, fine grained, moist				
10	952							
						1883	3.2/5	
15	947							
						2012	3.1/5	
				Wet @ 18.5'				
20	942							
25								



Water level based on soil saturation during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\SV-1.bo

WENCK ASSOCIATES

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LOG OF Vent Well SV-2

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

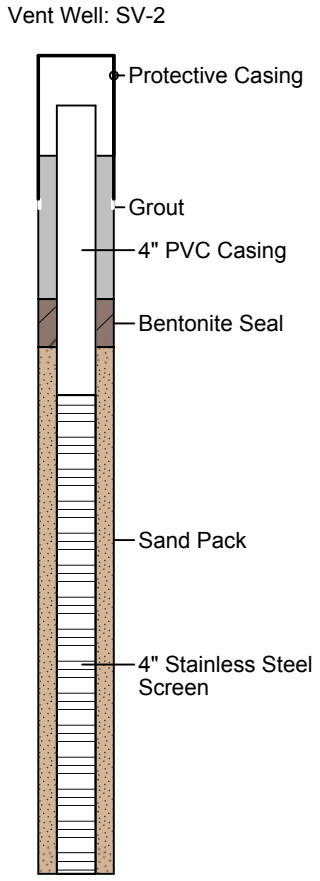
Project # B3228-0009

Dates (boring)	: 11/9/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/9/15	Driller	: Dusty Schroeder
Hole Diameter	: 10"	Driller Assistant	: Tucker
Drilling Method	: Push probe/HSA	Logged By	: Dan Larson
Sampling Method	: Macro Core	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

General Location:
Approx. 30 feet east of SV-1

Depth in Feet	Approx. Surf. Elev.962	USCS	GRAPHIC	DESCRIPTION	Sample	PID (PPM)	Soil Revovery (ft.)	GRAPHIC
0	962			Grass Surface				
		SM		SANDY SILT (SM), dark brown, moist		2209	3/5	
5	957	SM		SILTY SAND (SM), grey-brown, fine grained, medium dense, moist to slightly wet		1688	3/5	
10	952	SP		SAND, Poorly Graded (SP), grey-brown, fine grained, moist, rust-brown lamination		2437	3.9/5	
15	947							
20	942							
25								



Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\SV-2.bo

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LOG OF Monitoring Point P-1S

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/10/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/10/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

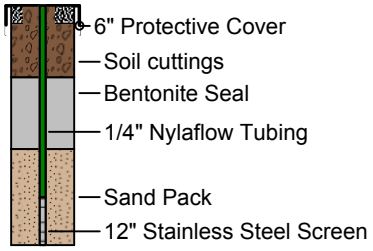
Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

General Location:
29 feet south-southeast of SV-1

Depth in Feet	Approx. Surf. Elev.962	USCS	DESCRIPTION
0	962		Grass Surface
		SM	SILTY SAND (SM), fine grained, dark brown, moist
		SC	CLAYEY SAND (SC), some silt, dark gray, fine grained, moist to wet
		SM	SILTY SAND (SM), gray-brown, fine grained, medium dense, moist
5	957		Decreasing silt towards bottom
10	952		
15	947		
20	942		
25			

Sample Interval

GRAPHIC



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-1S.bo

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LOG OF Monitoring Point P-2S / 2D

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/10/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/10/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

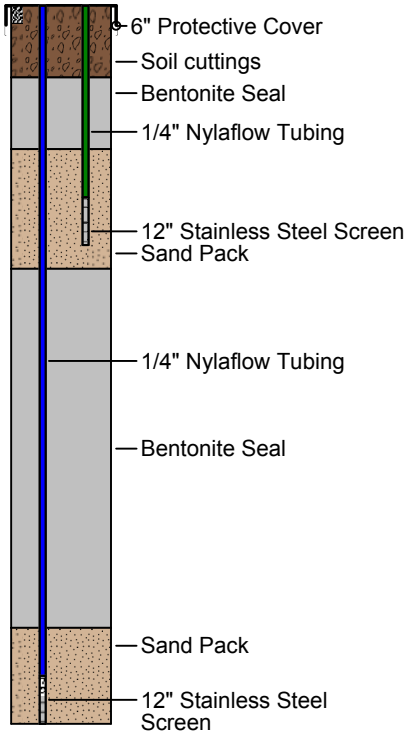
General Location:
42 feet east-southeast of SV-1

Monitoring Points
2S and 2D

Depth in Feet	Approx. Surf. Elev.962	USCS	DESCRIPTION
0	962		Grass Surface
		SM	SILTY SAND (SM), trace gravel, fine grained, dark brown, moist
		SP	SAND, Poorly Graded (SP), gray, very fine grained, trace silt, wet
5	957	SM	SILTY SAND (SM), gray-brown, fine grained, medium dense, moist
10	952	SP	SAND, Poorly Graded (SP), gray-brown, fine grained, medium dense, moist
15	947		
20	942		
25			

Sample Interval

GRAPHIC



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-2S-2D.bo

WENCK ASSOCIATES

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LOG OF Monitoring Point P-3S / 3D

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/10/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/10/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

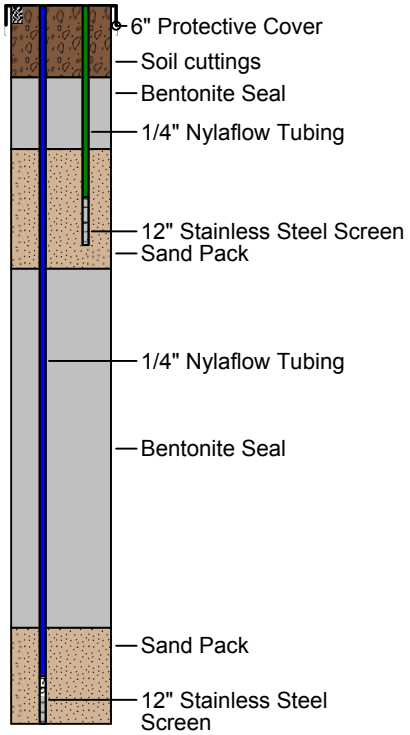
General Location:
27 feet north-northeast of SV-1

Monitoring Points
3S and 3D

Depth in Feet	Approx. Surf. Elev.962	USCS	DESCRIPTION
0	962		Grass Surface
		SM	SILTY SAND (SM), trace gravel, fine grained, trace gravel, dark brown, moist
		SP	SAND, Poorly Graded (SP), gray, very fine grained, trace silt, wet
5	957		
		SM	SILTY SAND (SM), gray, fine grained, medium dense, moist
		SP	SAND, Poorly Graded (SP), gray-brown, fine grained, medium dense, moist Very dense 10-15'
10	952		
15	947		
20	942		
25			

Sample Interval

GRAPHIC



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-3S-3D.bo

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

LOG OF Monitoring Point P-4D

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/10/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/10/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

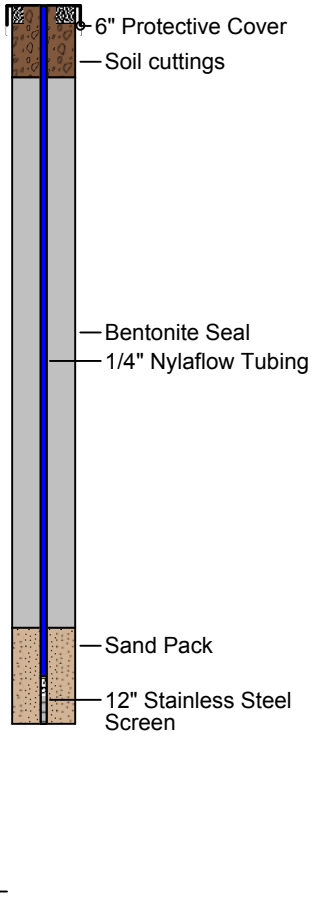
General Location:
70 feet north of SV-1

Depth in Feet	Approx. Surf. Elev.963	USCS	DESCRIPTION
0	963		Grass Surface
		SM	SILTY SAND (SM), some gravel, brown to dark brown, fine grained, moist
		SC	CLAYEY, SILTY SAND (SC), brown, fine grained, soft, wet
5	958	SP	SAND, Poorly Graded (SP), brown, fine grained, medium dense, moist gray and very fine grained 5.5-10'
10	953		gray-brown and fine grained 10-15'
15	948		
20	943		
25			

Sample Interval

GRAPHIC

Monitoring Point 4D



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-4D.bo

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

LOG OF Monitoring Point P-5S

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/10/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/10/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

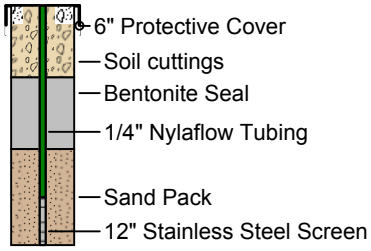
Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

General Location:
151 feet north of SV-1

Depth in Feet	Approx. Surf. Elev.965	USCS	DESCRIPTION
0	965		Concrete
		SP	SAND, Poorly Graded (SP), some gravel and trace silt, brown, fine grained, moist No gravel or silt 1.5-4'
5	960	SM	SILTY SAND (SM), brown, fine grained, dense, moist
10	955		
15	950		
20	945		
25			

Sample Interval

GRAPHIC



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-5S.bo

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

LOG OF Monitoring Point P-6D

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/10/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/10/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

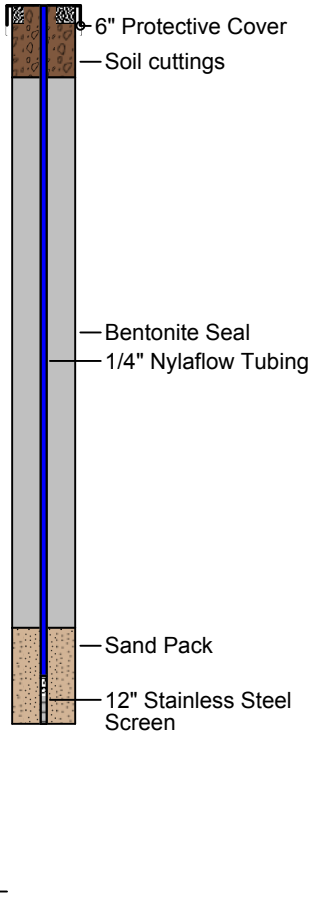
General Location:
87 feet east of SV-1

Depth in Feet	Approx. Surf. Elev.964	USCS	DESCRIPTION
0	964		Grass Surface
		SP	SAND, Poorly Graded (SP), some gravel and trace silt, brown, fine grained, moist
		SM	SILTY SAND (SM), dark brown, fine grained, medium dense, moist
			Color change to brown 2.5-6'
5	959		
		SP	SAND, Poorly Graded (SP), brown, fine grained, wet
			Moist 6.5 to 15
10	954		
15	949		
20	944		
25			

Sample Interval

GRAPHIC

Monitoring Point 6D



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-6D.bo

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

LOG OF Monitoring Point P-7S / 7D

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/10/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/10/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

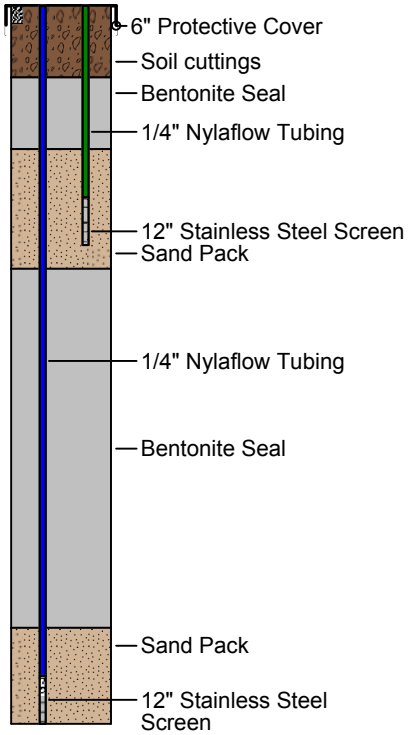
General Location:
78 feet south of SV-1

Monitoring Points
7S and 7D

Depth in Feet	Approx. Surf. Elev.962	USCS	DESCRIPTION
0	962		Grass Surface
		SM	SILTY SAND (SM), trace gravel, fine grained, dark brown, moist
		SP	SAND, Poorly Graded (SP), brown, very fine grained, wet
		SM	SILTY SAND (SM), brown, fine grained, medium dense, moist
5	957		
		SP	SAND, Poorly Graded (SP), gray, fine grained, medium dense, moist
10	952		
15	947		
20	942		
25			

Sample Interval

GRAPHIC



Notes: Used Geoprobe 3-1/4" Dual-tube to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-7S-7D.bo

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

LOG OF Monitoring Point P-8D

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/10/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/10/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

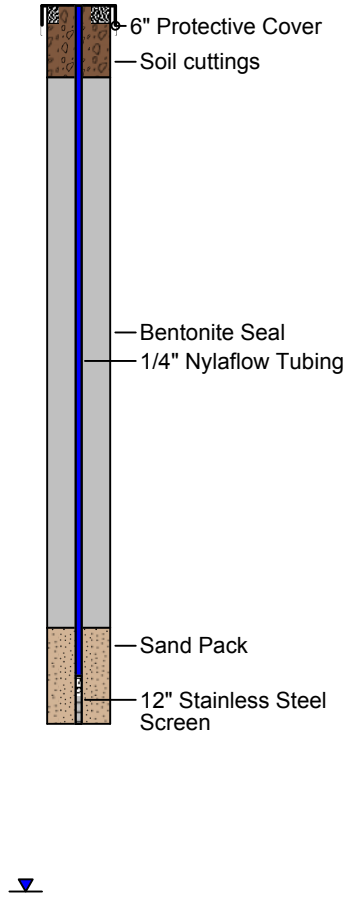
Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

General Location:
116 feet south of SV-1

Depth in Feet	Approx. Surf. Elev.962	USCS	DESCRIPTION
0	962		Grass Surface
		SM	SILTY SAND (SM), dark brown, fine grained, moist
		SP	SAND, Poorly Graded (SP), brown, fine grained, moist Wet 3-4'
5	957	SM	SILTY SAND (SM), brown, fine grained, moist
		SP	SAND, Poorly Graded (SP), golden brown, fine grained, moist Light brown with dark brown lamination 9-10' Very dense 10-15'
10	952		
15	947		
20	942		
25			

Sample Interval

GRAPHIC



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-8D.bo

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

LOG OF Monitoring Point P-9S / 9D

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/11/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/11/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

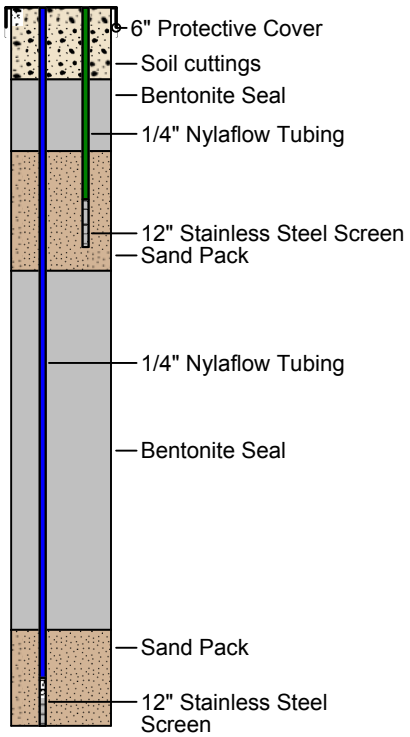
General Location:
76 feet west of SV-1

Depth in Feet	Approx. Surf. Elev.962	USCS	DESCRIPTION
0	962	GP	Gravel Surface (parking lot)
		SP	SAND, Poorly Graded (SP), some gravel, brown, fine to medium grained, moist,
		SM	SILTY SAND (SM), brown, very fine grained, moist
		SP	SAND, Poorly Graded (SP), trace silt, brown, very fine grained, moist,
5	957	SM	SILTY SAND (SM), brown, fine to medium grained, moist to slightly wet
		SP	SAND, Poorly Graded (SP), brown, very fine grained, moist changes to fine grained 8-15'
10	952		
15	947		
20	942		
25			

Sample Interval

GRAPHIC

Monitoring Points
9S and 9D



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-9S-9D.bo

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

LOG OF Monitoring Point P-10S / 10D

Mille Lacs Oil - Former Union 76
Pilot Test
Cambridge, MN

Project # B3228-0009

Dates (boring)	: 11/11/15	Drilling Contractor	: Midwestern Drilling
Dates (mon. well)	: 11/11/15	Driller	: Dusty Schroeder
Hole Diameter	: 3.25"	Driller Assistant	: Tucker
Drilling Method	: Push probe	Logged By	: Dan Larson
Sampling Method	: Dual Tube (3-1/4")	Checked By	: Adam Zobel

Sample Type
- Dual Tube Sample
- Macro Core Sample
- Split Spoon Sample

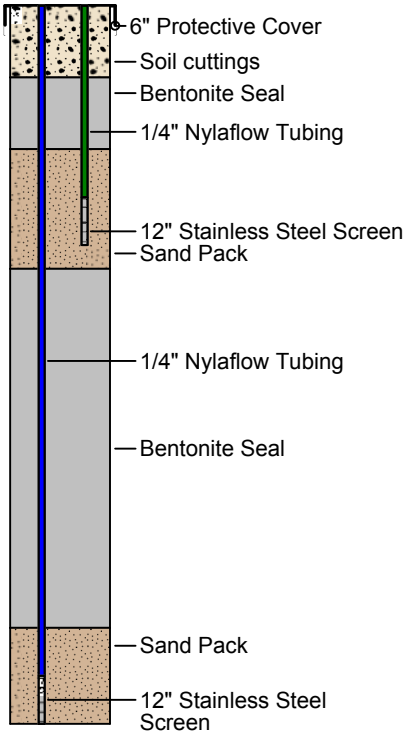
General Location:
134 feet southwest of SV-1

Monitoring Points
10S and 10D

Depth in Feet	Approx. Surf. Elev.962	USCS	DESCRIPTION
0	962	GP	Gravel Surface (parking lot)
		SP	SAND, Poorly Graded (SP), trace gravel and silt, brown, fine to medium grained, moist (fill)
		SM	SILTY SAND (SM), brown to dark brown, fine grained, moist
5	957		Cobble & concrete 5-8.5 (fill)
		SP	SAND, Poorly Graded (SP), gray-brown, fine grained, moist
10	952		Very dense 12-15'
15	947		
20	942		
25			

Sample Interval

GRAPHIC



Notes: Used Geoprobe Dual-tube 3-1/4" to set monitoring points. Water level based on soil saturation in SV-1 during soil sampling (11/9/15)

01-28-2016 \\FRANCIS\Vol1\3228 - Mille Lacs Oil\09 Pilot Test Cambridge\Quicklog\P-10S-10D.bo

Appendix D

Laboratory Reports and Chain-of-Custody Forms

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

November 30, 2015

Adam P. Zobel
Wenck Associates, Inc
1800 Pioneer Creek Center
P.O. BOX 249
Maple Plain, MN 55359

RE: Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Dear Adam Zobel:
Enclosed are the analytical results for sample(s) received by the laboratory on November 19, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kabor Xiong
kabor.xiong@pacelabs.com
Project Manager

Enclosures

cc: Dan Larson, Wenck Assoicates

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(612)607-1700

CERTIFICATIONS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

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Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Sample: E-1 **Lab ID: 10330584001** Collected: 11/16/15 13:05 Received: 11/19/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	ND	ug/m3	82900	34406.4		11/24/15 06:11	67-64-1	
Benzene	**3690000**	ug/m3	22400	34406.4		11/24/15 06:11	71-43-2	
Benzyl chloride	ND	ug/m3	36100	34406.4		11/24/15 06:11	100-44-7	
Bromodichloromethane	ND	ug/m3	117000	34406.4		11/24/15 06:11	75-27-4	
Bromoform	ND	ug/m3	181000	34406.4		11/24/15 06:11	75-25-2	
Bromomethane	ND	ug/m3	27200	34406.4		11/24/15 06:11	74-83-9	
1,3-Butadiene	ND	ug/m3	15500	34406.4		11/24/15 06:11	106-99-0	
2-Butanone (MEK)	ND	ug/m3	103000	34406.4		11/24/15 06:11	78-93-3	
Carbon disulfide	ND	ug/m3	21700	34406.4		11/24/15 06:11	75-15-0	
Carbon tetrachloride	ND	ug/m3	110000	34406.4		11/24/15 06:11	56-23-5	
Chlorobenzene	ND	ug/m3	32300	34406.4		11/24/15 06:11	108-90-7	
Chloroethane	ND	ug/m3	18600	34406.4		11/24/15 06:11	75-00-3	
Chloroform	ND	ug/m3	34100	34406.4		11/24/15 06:11	67-66-3	
Chloromethane	ND	ug/m3	14500	34406.4		11/24/15 06:11	74-87-3	
Cyclohexane	**14400000**	ug/m3	24100	34406.4		11/24/15 06:11	110-82-7	E
Dibromochloromethane	ND	ug/m3	59500	34406.4		11/24/15 06:11	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	53700	34406.4		11/24/15 06:11	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	105000	34406.4		11/24/15 06:11	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	105000	34406.4		11/24/15 06:11	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	42000	34406.4		11/24/15 06:11	106-46-7	
Dichlorodifluoromethane	ND	ug/m3	34800	34406.4		11/24/15 06:11	75-71-8	
1,1-Dichloroethane	ND	ug/m3	28200	34406.4		11/24/15 06:11	75-34-3	
1,2-Dichloroethane	ND	ug/m3	14100	34406.4		11/24/15 06:11	107-06-2	
1,1-Dichloroethene	ND	ug/m3	27900	34406.4		11/24/15 06:11	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	27900	34406.4		11/24/15 06:11	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	27900	34406.4		11/24/15 06:11	156-60-5	
1,2-Dichloropropane	ND	ug/m3	32300	34406.4		11/24/15 06:11	78-87-5	

REPORT OF LABORATORY ANALYSIS

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1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Sample: E-1 **Lab ID: 10330584001** Collected: 11/16/15 13:05 Received: 11/19/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
cis-1,3-Dichloropropene	ND	ug/m3	79400	34406.4		11/24/15 06:11	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	79400	34406.4		11/24/15 06:11	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	48900	34406.4		11/24/15 06:11	76-14-2	
Ethanol	ND	ug/m3	165000	34406.4		11/24/15 06:11	64-17-5	
Ethyl acetate	ND	ug/m3	25100	34406.4		11/24/15 06:11	141-78-6	
Ethylbenzene	**482000**	ug/m3	30300	34406.4		11/24/15 06:11	100-41-4	
4-Ethyltoluene	**69100**	ug/m3	34400	34406.4		11/24/15 06:11	622-96-8	
n-Heptane	**4690000**	ug/m3	28600	34406.4		11/24/15 06:11	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	186000	34406.4		11/24/15 06:11	87-68-3	
n-Hexane	**11100000**	ug/m3	24800	34406.4		11/24/15 06:11	110-54-3	E
2-Hexanone	ND	ug/m3	143000	34406.4		11/24/15 06:11	591-78-6	
Methylene Chloride	**167000**	ug/m3	121000	34406.4		11/24/15 06:11	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	143000	34406.4		11/24/15 06:11	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	126000	34406.4		11/24/15 06:11	1634-04-4	
Naphthalene	ND	ug/m3	183000	34406.4		11/24/15 06:11	91-20-3	
2-Propanol	ND	ug/m3	86000	34406.4		11/24/15 06:11	67-63-0	
Propylene	ND	ug/m3	12000	34406.4		11/24/15 06:11	115-07-1	
Styrene	ND	ug/m3	29900	34406.4		11/24/15 06:11	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	48000	34406.4		11/24/15 06:11	79-34-5	
Tetrachloroethene	ND	ug/m3	23700	34406.4		11/24/15 06:11	127-18-4	
Tetrahydrofuran	ND	ug/m3	20600	34406.4		11/24/15 06:11	109-99-9	
Toluene	**3260000**	ug/m3	26500	34406.4		11/24/15 06:11	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	259000	34406.4		11/24/15 06:11	120-82-1	
1,1,1-Trichloroethane	ND	ug/m3	38200	34406.4		11/24/15 06:11	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	18900	34406.4		11/24/15 06:11	79-00-5	
Trichloroethene	ND	ug/m3	18900	34406.4		11/24/15 06:11	79-01-6	
Trichlorofluoromethane	ND	ug/m3	39200	34406.4		11/24/15 06:11	75-69-4	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Sample: E-1 **Lab ID: 10330584001** Collected: 11/16/15 13:05 Received: 11/19/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	55100	34406.4		11/24/15 06:11	76-13-1	
1,2,4-Trimethylbenzene	**104000**	ug/m3	34400	34406.4		11/24/15 06:11	95-63-6	
1,3,5-Trimethylbenzene	**67700**	ug/m3	34400	34406.4		11/24/15 06:11	108-67-8	
Vinyl acetate	ND	ug/m3	61600	34406.4		11/24/15 06:11	108-05-4	
Vinyl chloride	ND	ug/m3	8950	34406.4		11/24/15 06:11	75-01-4	
m&p-Xylene	**1660000**	ug/m3	60900	34406.4		11/24/15 06:11	179601-23-1	
o-Xylene	**459000**	ug/m3	30300	34406.4		11/24/15 06:11	95-47-6	

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ANALYTICAL RESULTS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Sample: E-2 **Lab ID: 10330584002** Collected: 11/17/15 13:18 Received: 11/19/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	ND	ug/m3	88800	36864		11/24/15 06:44	67-64-1	
Benzene	**3780000**	ug/m3	24000	36864		11/24/15 06:44	71-43-2	
Benzyl chloride	ND	ug/m3	38700	36864		11/24/15 06:44	100-44-7	
Bromodichloromethane	ND	ug/m3	126000	36864		11/24/15 06:44	75-27-4	
Bromoform	ND	ug/m3	194000	36864		11/24/15 06:44	75-25-2	
Bromomethane	ND	ug/m3	29100	36864		11/24/15 06:44	74-83-9	
1,3-Butadiene	ND	ug/m3	16600	36864		11/24/15 06:44	106-99-0	
2-Butanone (MEK)	ND	ug/m3	111000	36864		11/24/15 06:44	78-93-3	
Carbon disulfide	ND	ug/m3	23200	36864		11/24/15 06:44	75-15-0	
Carbon tetrachloride	ND	ug/m3	118000	36864		11/24/15 06:44	56-23-5	
Chlorobenzene	ND	ug/m3	34700	36864		11/24/15 06:44	108-90-7	
Chloroethane	ND	ug/m3	19900	36864		11/24/15 06:44	75-00-3	
Chloroform	ND	ug/m3	36500	36864		11/24/15 06:44	67-66-3	
Chloromethane	ND	ug/m3	15500	36864		11/24/15 06:44	74-87-3	
Cyclohexane	**15300000**	ug/m3	25800	36864		11/24/15 06:44	110-82-7	E
Dibromochloromethane	ND	ug/m3	63800	36864		11/24/15 06:44	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	57500	36864		11/24/15 06:44	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	113000	36864		11/24/15 06:44	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	113000	36864		11/24/15 06:44	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	45000	36864		11/24/15 06:44	106-46-7	
Dichlorodifluoromethane	ND	ug/m3	37200	36864		11/24/15 06:44	75-71-8	
1,1-Dichloroethane	ND	ug/m3	30200	36864		11/24/15 06:44	75-34-3	
1,2-Dichloroethane	ND	ug/m3	15100	36864		11/24/15 06:44	107-06-2	
1,1-Dichloroethene	ND	ug/m3	29900	36864		11/24/15 06:44	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	29900	36864		11/24/15 06:44	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	29900	36864		11/24/15 06:44	156-60-5	
1,2-Dichloropropane	ND	ug/m3	34700	36864		11/24/15 06:44	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	85000	36864		11/24/15 06:44	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	85000	36864		11/24/15 06:44	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	52300	36864		11/24/15 06:44	76-14-2	
Ethanol	ND	ug/m3	177000	36864		11/24/15 06:44	64-17-5	
Ethyl acetate	ND	ug/m3	26900	36864		11/24/15 06:44	141-78-6	
Ethylbenzene	**678000**	ug/m3	32400	36864		11/24/15 06:44	100-41-4	
4-Ethyltoluene	**113000**	ug/m3	36900	36864		11/24/15 06:44	622-96-8	
n-Heptane	**5180000**	ug/m3	30600	36864		11/24/15 06:44	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	200000	36864		11/24/15 06:44	87-68-3	
n-Hexane	**11300000**	ug/m3	26500	36864		11/24/15 06:44	110-54-3	E
2-Hexanone	ND	ug/m3	154000	36864		11/24/15 06:44	591-78-6	
Methylene Chloride	**187000**	ug/m3	130000	36864		11/24/15 06:44	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	154000	36864		11/24/15 06:44	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	135000	36864		11/24/15 06:44	1634-04-4	
Naphthalene	ND	ug/m3	196000	36864		11/24/15 06:44	91-20-3	
2-Propanol	ND	ug/m3	92200	36864		11/24/15 06:44	67-63-0	
Propylene	ND	ug/m3	12900	36864		11/24/15 06:44	115-07-1	
Styrene	ND	ug/m3	32100	36864		11/24/15 06:44	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	51500	36864		11/24/15 06:44	79-34-5	
Tetrachloroethene	ND	ug/m3	25400	36864		11/24/15 06:44	127-18-4	

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ANALYTICAL RESULTS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Sample: E-2 **Lab ID: 10330584002** Collected: 11/17/15 13:18 Received: 11/19/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Tetrahydrofuran	ND	ug/m3	22100	36864		11/24/15 06:44	109-99-9	
Toluene	**3340000**	ug/m3	28400	36864		11/24/15 06:44	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	278000	36864		11/24/15 06:44	120-82-1	
1,1,1-Trichloroethane	ND	ug/m3	40900	36864		11/24/15 06:44	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	20300	36864		11/24/15 06:44	79-00-5	
Trichloroethene	ND	ug/m3	20300	36864		11/24/15 06:44	79-01-6	
Trichlorofluoromethane	ND	ug/m3	42000	36864		11/24/15 06:44	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	59000	36864		11/24/15 06:44	76-13-1	
1,2,4-Trimethylbenzene	**245000**	ug/m3	36800	36864		11/24/15 06:44	95-63-6	
1,3,5-Trimethylbenzene	**118000**	ug/m3	36800	36864		11/24/15 06:44	108-67-8	
Vinyl acetate	ND	ug/m3	65900	36864		11/24/15 06:44	108-05-4	
Vinyl chloride	ND	ug/m3	9580	36864		11/24/15 06:44	75-01-4	
m&p-Xylene	**2450000**	ug/m3	65200	36864		11/24/15 06:44	179601-23-1	
o-Xylene	**735000**	ug/m3	32400	36864		11/24/15 06:44	95-47-6	

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ANALYTICAL RESULTS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Sample: E-3 **Lab ID: 10330584003** Collected: 11/18/15 16:04 Received: 11/19/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	ND	ug/m3	85900	35635.2		11/24/15 07:16	67-64-1	
Benzene	**4050000**	ug/m3	23200	35635.2		11/24/15 07:16	71-43-2	E
Benzyl chloride	ND	ug/m3	37400	35635.2		11/24/15 07:16	100-44-7	
Bromodichloromethane	ND	ug/m3	121000	35635.2		11/24/15 07:16	75-27-4	
Bromoform	ND	ug/m3	187000	35635.2		11/24/15 07:16	75-25-2	
Bromomethane	ND	ug/m3	28200	35635.2		11/24/15 07:16	74-83-9	
1,3-Butadiene	ND	ug/m3	16000	35635.2		11/24/15 07:16	106-99-0	
2-Butanone (MEK)	ND	ug/m3	107000	35635.2		11/24/15 07:16	78-93-3	
Carbon disulfide	ND	ug/m3	22500	35635.2		11/24/15 07:16	75-15-0	
Carbon tetrachloride	ND	ug/m3	114000	35635.2		11/24/15 07:16	56-23-5	
Chlorobenzene	ND	ug/m3	33500	35635.2		11/24/15 07:16	108-90-7	
Chloroethane	ND	ug/m3	19200	35635.2		11/24/15 07:16	75-00-3	
Chloroform	ND	ug/m3	35300	35635.2		11/24/15 07:16	67-66-3	
Chloromethane	ND	ug/m3	15000	35635.2		11/24/15 07:16	74-87-3	
Cyclohexane	**15800000**	ug/m3	24900	35635.2		11/24/15 07:16	110-82-7	E
Dibromochloromethane	ND	ug/m3	61600	35635.2		11/24/15 07:16	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	55600	35635.2		11/24/15 07:16	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	109000	35635.2		11/24/15 07:16	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	109000	35635.2		11/24/15 07:16	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	43500	35635.2		11/24/15 07:16	106-46-7	
Dichlorodifluoromethane	ND	ug/m3	36000	35635.2		11/24/15 07:16	75-71-8	
1,1-Dichloroethane	ND	ug/m3	29200	35635.2		11/24/15 07:16	75-34-3	
1,2-Dichloroethane	ND	ug/m3	14600	35635.2		11/24/15 07:16	107-06-2	
1,1-Dichloroethene	ND	ug/m3	28900	35635.2		11/24/15 07:16	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	28900	35635.2		11/24/15 07:16	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	28900	35635.2		11/24/15 07:16	156-60-5	
1,2-Dichloropropane	ND	ug/m3	33500	35635.2		11/24/15 07:16	78-87-5	

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ANALYTICAL RESULTS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Sample: E-3 **Lab ID: 10330584003** Collected: 11/18/15 16:04 Received: 11/19/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
cis-1,3-Dichloropropene	ND	ug/m3	82200	35635.2		11/24/15 07:16	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	82200	35635.2		11/24/15 07:16	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	50600	35635.2		11/24/15 07:16	76-14-2	
Ethanol	ND	ug/m3	171000	35635.2		11/24/15 07:16	64-17-5	
Ethyl acetate	ND	ug/m3	26000	35635.2		11/24/15 07:16	141-78-6	
Ethylbenzene	**626000**	ug/m3	31400	35635.2		11/24/15 07:16	100-41-4	
4-Ethyltoluene	**79800**	ug/m3	35600	35635.2		11/24/15 07:16	622-96-8	
n-Heptane	**5380000**	ug/m3	29600	35635.2		11/24/15 07:16	142-82-5	E
Hexachloro-1,3-butadiene	ND	ug/m3	193000	35635.2		11/24/15 07:16	87-68-3	
n-Hexane	**11700000**	ug/m3	25700	35635.2		11/24/15 07:16	110-54-3	E
2-Hexanone	ND	ug/m3	148000	35635.2		11/24/15 07:16	591-78-6	
Methylene Chloride	**198000**	ug/m3	126000	35635.2		11/24/15 07:16	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	148000	35635.2		11/24/15 07:16	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	131000	35635.2		11/24/15 07:16	1634-04-4	
Naphthalene	ND	ug/m3	190000	35635.2		11/24/15 07:16	91-20-3	
2-Propanol	ND	ug/m3	89100	35635.2		11/24/15 07:16	67-63-0	
Propylene	ND	ug/m3	12500	35635.2		11/24/15 07:16	115-07-1	
Styrene	ND	ug/m3	31000	35635.2		11/24/15 07:16	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	49700	35635.2		11/24/15 07:16	79-34-5	
Tetrachloroethene	ND	ug/m3	24600	35635.2		11/24/15 07:16	127-18-4	
Tetrahydrofuran	ND	ug/m3	21400	35635.2		11/24/15 07:16	109-99-9	
Toluene	**4290000**	ug/m3	27400	35635.2		11/24/15 07:16	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	269000	35635.2		11/24/15 07:16	120-82-1	
1,1,1-Trichloroethane	ND	ug/m3	39600	35635.2		11/24/15 07:16	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	19600	35635.2		11/24/15 07:16	79-00-5	
Trichloroethene	ND	ug/m3	19600	35635.2		11/24/15 07:16	79-01-6	
Trichlorofluoromethane	ND	ug/m3	40600	35635.2		11/24/15 07:16	75-69-4	

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ANALYTICAL RESULTS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Sample: E-3 **Lab ID: 10330584003** Collected: 11/18/15 16:04 Received: 11/19/15 09:45 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	57000	35635.2		11/24/15 07:16	76-13-1	
1,2,4-Trimethylbenzene	**147000**	ug/m3	35600	35635.2		11/24/15 07:16	95-63-6	
1,3,5-Trimethylbenzene	**81700**	ug/m3	35600	35635.2		11/24/15 07:16	108-67-8	
Vinyl acetate	ND	ug/m3	63800	35635.2		11/24/15 07:16	108-05-4	
Vinyl chloride	ND	ug/m3	9270	35635.2		11/24/15 07:16	75-01-4	
m&p-Xylene	**2070000**	ug/m3	63100	35635.2		11/24/15 07:16	179601-23-1	
o-Xylene	ND	ug/m3	31400	35635.2		11/24/15 07:16	95-47-6	

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QUALITY CONTROL DATA

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

QC Batch: AIR/24698 Analysis Method: TO-15
QC Batch Method: TO-15 Analysis Description: TO15 MSV AIR Low Level
Associated Lab Samples: 10330584001, 10330584002, 10330584003

METHOD BLANK: 2142742 Matrix: Air
Associated Lab Samples: 10330584001, 10330584002, 10330584003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1-Trichloroethane	ug/m3	ND	1.1	11/23/15 13:00	
1,1,2,2-Tetrachloroethane	ug/m3	ND	1.4	11/23/15 13:00	
1,1,2-Trichloroethane	ug/m3	ND	0.55	11/23/15 13:00	
1,1,2-Trichlorotrifluoroethane	ug/m3	ND	1.6	11/23/15 13:00	
1,1-Dichloroethane	ug/m3	ND	0.82	11/23/15 13:00	
1,1-Dichloroethene	ug/m3	ND	0.81	11/23/15 13:00	
1,2,4-Trichlorobenzene	ug/m3	ND	7.5	11/23/15 13:00	
1,2,4-Trimethylbenzene	ug/m3	ND	1.0	11/23/15 13:00	
1,2-Dibromoethane (EDB)	ug/m3	ND	1.6	11/23/15 13:00	
1,2-Dichlorobenzene	ug/m3	ND	3.1	11/23/15 13:00	
1,2-Dichloroethane	ug/m3	ND	0.41	11/23/15 13:00	
1,2-Dichloropropane	ug/m3	ND	0.94	11/23/15 13:00	
1,3,5-Trimethylbenzene	ug/m3	ND	1.0	11/23/15 13:00	
1,3-Butadiene	ug/m3	ND	0.45	11/23/15 13:00	
1,3-Dichlorobenzene	ug/m3	ND	3.1	11/23/15 13:00	
1,4-Dichlorobenzene	ug/m3	ND	1.2	11/23/15 13:00	
2-Butanone (MEK)	ug/m3	ND	3.0	11/23/15 13:00	
2-Hexanone	ug/m3	ND	4.2	11/23/15 13:00	
2-Propanol	ug/m3	ND	2.5	11/23/15 13:00	
4-Ethyltoluene	ug/m3	ND	1.0	11/23/15 13:00	
4-Methyl-2-pentanone (MIBK)	ug/m3	ND	4.2	11/23/15 13:00	
Acetone	ug/m3	ND	2.4	11/23/15 13:00	
Benzene	ug/m3	ND	0.65	11/23/15 13:00	
Benzyl chloride	ug/m3	ND	1.0	11/23/15 13:00	
Bromodichloromethane	ug/m3	ND	3.4	11/23/15 13:00	
Bromoform	ug/m3	ND	5.3	11/23/15 13:00	
Bromomethane	ug/m3	ND	0.79	11/23/15 13:00	
Carbon disulfide	ug/m3	ND	0.63	11/23/15 13:00	
Carbon tetrachloride	ug/m3	ND	3.2	11/23/15 13:00	
Chlorobenzene	ug/m3	ND	0.94	11/23/15 13:00	
Chloroethane	ug/m3	ND	0.54	11/23/15 13:00	
Chloroform	ug/m3	ND	0.99	11/23/15 13:00	
Chloromethane	ug/m3	ND	0.42	11/23/15 13:00	
cis-1,2-Dichloroethene	ug/m3	ND	0.81	11/23/15 13:00	
cis-1,3-Dichloropropene	ug/m3	ND	2.3	11/23/15 13:00	
Cyclohexane	ug/m3	ND	0.70	11/23/15 13:00	
Dibromochloromethane	ug/m3	ND	1.7	11/23/15 13:00	
Dichlorodifluoromethane	ug/m3	ND	1.0	11/23/15 13:00	
Dichlorotetrafluoroethane	ug/m3	ND	1.4	11/23/15 13:00	
Ethanol	ug/m3	ND	4.8	11/23/15 13:00	
Ethyl acetate	ug/m3	ND	0.73	11/23/15 13:00	

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QUALITY CONTROL DATA

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

METHOD BLANK: 2142742 Matrix: Air
Associated Lab Samples: 10330584001, 10330584002, 10330584003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Ethylbenzene	ug/m3	ND	0.88	11/23/15 13:00	
Hexachloro-1,3-butadiene	ug/m3	ND	5.4	11/23/15 13:00	
m&p-Xylene	ug/m3	ND	1.8	11/23/15 13:00	
Methyl-tert-butyl ether	ug/m3	ND	3.7	11/23/15 13:00	
Methylene Chloride	ug/m3	ND	3.5	11/23/15 13:00	
n-Heptane	ug/m3	ND	0.83	11/23/15 13:00	
n-Hexane	ug/m3	ND	0.72	11/23/15 13:00	
Naphthalene	ug/m3	ND	5.3	11/23/15 13:00	
o-Xylene	ug/m3	ND	0.88	11/23/15 13:00	
Propylene	ug/m3	ND	0.35	11/23/15 13:00	
Styrene	ug/m3	ND	0.87	11/23/15 13:00	
Tetrachloroethene	ug/m3	ND	0.69	11/23/15 13:00	
Tetrahydrofuran	ug/m3	ND	0.60	11/23/15 13:00	
Toluene	ug/m3	ND	0.77	11/23/15 13:00	
trans-1,2-Dichloroethene	ug/m3	ND	0.81	11/23/15 13:00	
trans-1,3-Dichloropropene	ug/m3	ND	2.3	11/23/15 13:00	
Trichloroethene	ug/m3	ND	0.55	11/23/15 13:00	
Trichlorofluoromethane	ug/m3	ND	1.1	11/23/15 13:00	
Vinyl acetate	ug/m3	ND	1.8	11/23/15 13:00	
Vinyl chloride	ug/m3	ND	0.26	11/23/15 13:00	

LABORATORY CONTROL SAMPLE: 2142743

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1-Trichloroethane	ug/m3	55.5	65.7	118	72-140	
1,1,2,2-Tetrachloroethane	ug/m3	69.8	71.6	103	68-137	
1,1,2-Trichloroethane	ug/m3	55.5	69.6	125	66-138	
1,1,2-Trichlorotrifluoroethane	ug/m3	77.9	80.3	103	70-132	
1,1-Dichloroethane	ug/m3	41.2	46.5	113	68-137	
1,1-Dichloroethene	ug/m3	40.3	42.6	106	73-138	
1,2,4-Trichlorobenzene	ug/m3	75.5	74.8	99	48-150	
1,2,4-Trimethylbenzene	ug/m3	50	47.7	95	75-134	
1,2-Dibromoethane (EDB)	ug/m3	78.1	95.1	122	75-132	
1,2-Dichlorobenzene	ug/m3	61.2	59.4	97	71-129	
1,2-Dichloroethane	ug/m3	41.2	48.4	118	73-139	
1,2-Dichloropropane	ug/m3	47	55.6	118	70-130	
1,3,5-Trimethylbenzene	ug/m3	50	47.7	95	75-133	
1,3-Butadiene	ug/m3	22.5	23.2	103	66-135	
1,3-Dichlorobenzene	ug/m3	61.2	59.1	97	75-131	
1,4-Dichlorobenzene	ug/m3	61.2	65.4	107	69-135	
2-Butanone (MEK)	ug/m3	150	171	114	67-131	
2-Hexanone	ug/m3	208	193	93	72-130	
2-Propanol	ug/m3	125	138	110	66-133	
4-Ethyltoluene	ug/m3	50	47.6	95	75-130	

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QUALITY CONTROL DATA

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

LABORATORY CONTROL SAMPLE: 2142743

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
4-Methyl-2-pentanone (MIBK)	ug/m3	208	224	108	68-134	
Acetone	ug/m3	121	96.0	79	63-144	
Benzene	ug/m3	32.5	38.9	120	64-139	
Benzyl chloride	ug/m3	52.5	53.9	103	75-129	
Bromodichloromethane	ug/m3	68.2	67.9	100	75-134	
Bromoform	ug/m3	105	103	98	72-130	
Bromomethane	ug/m3	39.5	42.3	107	71-132	
Carbon disulfide	ug/m3	31.7	31.6	100	56-139	
Carbon tetrachloride	ug/m3	64	63.1	99	75-150	
Chlorobenzene	ug/m3	46.8	58.1	124	71-132	
Chloroethane	ug/m3	26.8	27.8	104	71-129	
Chloroform	ug/m3	49.7	56.1	113	73-136	
Chloromethane	ug/m3	21	21.8	104	52-143	
cis-1,2-Dichloroethene	ug/m3	40.3	48.4	120	64-137	
cis-1,3-Dichloropropene	ug/m3	46.2	45.4	98	75-128	
Cyclohexane	ug/m3	35	38.2	109	62-143	
Dibromochloromethane	ug/m3	86.6	83.2	96	75-136	
Dichlorodifluoromethane	ug/m3	50.3	56.9	113	70-141	
Dichlorotetrafluoroethane	ug/m3	71.1	77.8	109	71-139	
Ethanol	ug/m3	95.8	82.2	86	60-144	
Ethyl acetate	ug/m3	36.6	41.4	113	64-137	
Ethylbenzene	ug/m3	44.2	52.6	119	71-136	
Hexachloro-1,3-butadiene	ug/m3	108	107	99	51-150	
m&p-Xylene	ug/m3	88.3	104	117	71-134	
Methyl-tert-butyl ether	ug/m3	183	200	109	73-134	
Methylene Chloride	ug/m3	177	176	100	64-130	
n-Heptane	ug/m3	41.7	45.2	108	63-135	
n-Hexane	ug/m3	35.8	33.9	94	69-135	
Naphthalene	ug/m3	53.3	51.4	96	43-150	
o-Xylene	ug/m3	44.2	53.0	120	75-134	
Propylene	ug/m3	17.5	17.4	99	58-135	
Styrene	ug/m3	43.3	55.7	129	75-133	
Tetrachloroethene	ug/m3	69	79.1	115	66-137	
Tetrahydrofuran	ug/m3	30	32.8	109	58-135	
Toluene	ug/m3	38.3	45.5	119	70-129	
trans-1,2-Dichloroethene	ug/m3	40.3	46.2	115	61-140	
trans-1,3-Dichloropropene	ug/m3	46.2	45.8	99	75-134	
Trichloroethene	ug/m3	54.6	67.7	124	70-134	
Trichlorofluoromethane	ug/m3	57.1	60.9	107	67-140	
Vinyl acetate	ug/m3	35.8	30.5	85	60-139	
Vinyl chloride	ug/m3	26	27.1	104	72-129	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

SAMPLE DUPLICATE: 2143382

Parameter	Units	10330123001 Result	Dup Result	RPD	Qualifiers
1,1,1-Trichloroethane	ug/m3	<0.77	ND		
1,1,2,2-Tetrachloroethane	ug/m3	<0.49	ND		
1,1,2-Trichloroethane	ug/m3	<0.078	ND		
1,1,2-Trichlorotrifluoroethane	ug/m3	<1.1	ND		
1,1-Dichloroethane	ug/m3	<0.57	ND		
1,1-Dichloroethene	ug/m3	<0.071	ND		
1,2,4-Trichlorobenzene	ug/m3	<5.2	ND		
1,2,4-Trimethylbenzene	ug/m3	3.5	3.5	1	
1,2-Dibromoethane (EDB)	ug/m3	<1.1	ND		
1,2-Dichlorobenzene	ug/m3	<0.85	ND		
1,2-Dichloroethane	ug/m3	<0.064	ND		
1,2-Dichloropropane	ug/m3	<0.65	ND		
1,3,5-Trimethylbenzene	ug/m3	<0.70	ND		
1,3-Butadiene	ug/m3	<0.40	ND		
1,3-Dichlorobenzene	ug/m3	<0.85	ND		
1,4-Dichlorobenzene	ug/m3	1.5J	1.4J		
2-Butanone (MEK)	ug/m3	<2.1	ND		
2-Hexanone	ug/m3	3.3J	3.1J		
2-Propanol	ug/m3	15.8	16.6	5	
4-Ethyltoluene	ug/m3	2.2	2.1	3	
4-Methyl-2-pentanone (MIBK)	ug/m3	<2.9	ND		
Acetone	ug/m3	20.4	20.5	0	
Benzene	ug/m3	3.1	3.1	0	
Benzyl chloride	ug/m3	<0.73	ND		
Bromodichloromethane	ug/m3	<0.097	ND		
Bromoform	ug/m3	<0.15	ND		
Bromomethane	ug/m3	<0.87	ND		
Carbon disulfide	ug/m3	0.67J	.73J		
Carbon tetrachloride	ug/m3	<0.095	ND		
Chlorobenzene	ug/m3	<0.65	ND		
Chloroethane	ug/m3	<0.043	ND		
Chloroform	ug/m3	0.71J	.68J		
Chloromethane	ug/m3	<0.029	ND		
cis-1,2-Dichloroethene	ug/m3	<0.057	ND		
cis-1,3-Dichloropropene	ug/m3	<0.64	ND		
Cyclohexane	ug/m3	2.7	2.8	2	
Dibromochloromethane	ug/m3	<1.2	ND		
Dichlorodifluoromethane	ug/m3	1.9	1.9	0	
Dichlorotetrafluoroethane	ug/m3	<0.99	ND		
Ethanol	ug/m3	266	269	1	
Ethyl acetate	ug/m3	4.3	4.3	0	
Ethylbenzene	ug/m3	1.9	1.9	5	
Hexachloro-1,3-butadiene	ug/m3	<7.5	ND		
m&p-Xylene	ug/m3	7.4	7.5	2	
Methyl-tert-butyl ether	ug/m3	<2.5	ND		
Methylene Chloride	ug/m3	39.0	22.6	53	R1
n-Heptane	ug/m3	2.2	2.3	4	

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(612)607-1700

QUALITY CONTROL DATA

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

SAMPLE DUPLICATE: 2143382

Parameter	Units	10330123001 Result	Dup Result	RPD	Qualifiers
n-Hexane	ug/m3	10.7	8.5	23	
Naphthalene	ug/m3	5.0J	5.1J		
o-Xylene	ug/m3	2.4	2.4	2	
Propylene	ug/m3	92.9	103	11	E
Styrene	ug/m3	1.1J	1.2		
Tetrachloroethene	ug/m3	0.49J	ND		
Tetrahydrofuran	ug/m3	<0.042	ND		
Toluene	ug/m3	15.5	13.1	16	
trans-1,2-Dichloroethene	ug/m3	<0.057	ND		
trans-1,3-Dichloropropene	ug/m3	<0.64	ND		
Trichloroethene	ug/m3	9600	1240	154	E,R1
Trichlorofluoromethane	ug/m3	1.4J	1.4J		
Vinyl acetate	ug/m3	<0.063	ND		
Vinyl chloride	ug/m3	<0.038	ND		

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QUALIFIERS

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

SAMPLE QUALIFIERS

Sample: 10330584001
[1] This result is reported from a serial dilution.
Sample: 10330584002
[1] This result is reported from a serial dilution.
Sample: 10330584003
[1] This result is reported from a serial dilution.

ANALYTE QUALIFIERS

E Analyte concentration exceeded the calibration range. The reported result is estimated.
R1 RPD value was outside control limits.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 3228 Mille Lacs Oil-Cambridge
Pace Project No.: 10330584

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10330584001	**E-1**	TO-15	AIR/24698		
10330584002	**E-2**	TO-15	AIR/24698		
10330584003	**E-3**	TO-15	AIR/24698		

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10330584

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AIR: CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

21591

Page: 1 of 1

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: Wenck	Report To: Adam Zobel	Attention:
Address: Maple Plain, MN	Copy To: Dan Lasson	Company Name:
Email To:	Purchase Order No.:	Address:
Phone: Fax:	Project Name: Mille Lacs Oil-Cambridge	Pace Quote Reference:
Requested Due Date/TAT:	Project Number: 3228	Pace Project Manager/Sales Rep.
		Pace Profile #:

Program: UST (circled) | Superfund | Emissions | Clean Air Act | Voluntary Clean Up | Dry Clean | RCRA | Other

Location of Sampling by State: MN

Reporting Units: ug/m³ ___ mg/m³ ___ PPBV ___ PPMV ___ Other ___

Report Level: II.___ III.___ IV.___ Other___

Valid Media Codes

MEDIA	CODE
Tedlar Bag	TB
1 Liter Summa Can	1LC
6 Liter Summa Can	6LC
Low Volume Puff	LVP
High Volume Puff	HVP
Other	PM10

ITEM #	'Section D Required Client Information AIR SAMPLE ID (Sample IDs MUST BE UNIQUE)	MEDIA CODE	PID Reading (Client only)	COLLECTED COMPOSITE START END/GRAB DATE	COLLECTED TIME	COMPOSITE - DATE	COMPOSITE - TIME	Canister Pressure (Initial Field - psig)	Canister Pressure (Final Field - psig)	Summa Can Number	Flow Control Number	Method: PM10	3C- Fixed Gas (%)	TO-3	TO-3M (Methane)	TO-4 (PCBs)	TO-13 (PAH)	TO-14	TO-15	TO15 Short List*	Pace Lab ID
1	E-1	1LC		11/16/15	12:56	11/16/15	13:05	-28	0	2841								X			001
2	E-2	1LC		11/17/15	13:10	11/17/15	13:18	-27.5	-2	2276								X			002
3	E-3	1LC		11/18/15	15:57	11/18/15	16:04	-27	-0.5	1330								X			003
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

Comments:

Sample ID	PID (ppm)
E-1	1,070
E-2	1,216
E-3	1,699

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Dan Lasson	11/18/15	16:40		11/18/15	16:40
	11/19/15	9:45		11-19-15	945

SAMPLE CONDITIONS

Temp in °C	Received on Ice	Custody Sealed Cooler	Samples Intact
	Y/N	Y/N	Y/N
	Y/N	Y/N	Y/N
	Y/N	Y/N	Y/N
	Y/N	Y/N	Y/N

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Dan Lasson

SIGNATURE of SAMPLER: Dan Lasson

DATE Signed (MM / DD / YY): 11/18/15

ORIGINAL

1700 Elm Street SE, Suite 200, Minneapolis, MN 55414 Air Technical Phone: 612.607.6386

Pace Analytical	Document Name: Air Sample Condition Upon Receipt	Document Revised: 29June2015 Page 1 of 1
	Document No.: F-MN-A-106-rev.10	Issuing Authority: Pace Minnesota Quality Office

Air Sample Condition Upon Receipt

Client Name: Wenck

Project #: WO# : 10330584

10330584

Courier: ☐ Fed Ex ☐ UPS ☐ Speedee ☑ Client ☐ Commercial ☐ Pace ☐ Other:_____

Tracking Number: _____

Custody Seal on Cooler/Box Present? ☐ Yes ☑ No **Seals Intact?** ☐ Yes ☑ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☑ Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☐ Tin Can ☐ Other:_____ **Temp Blank rec:** ☐ Yes ☑ No

Temp. (TO17 and TO13 samples only) (°C): X **Corrected Temp (°C):** X **Thermom. Used:** ☐ B88A912167504 ☐ B88A9132521491 ☐ 72337080 ☐ 80512447

Temp should be above freezing to 6°C **Correction Factor:** X **Date & Initials of Person Examining Contents:** 11/19/15

Type of ice Received ☐ Blue ☐ Wet ☒ None

				Comments:
Chain of Custody Present?	☑ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☑ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☑ Yes	☐ No	☐ N/A	3.
Sampler Name and/or Signature on COC?	☑ Yes	☐ No	☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☑ No	☐ N/A	7.
Sufficient Volume?	☑ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☑ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☑ Yes	☐ No	☐ N/A	
Containers Intact?	☑ Yes	☐ No	☐ N/A	10.
Media: (Air Can) Airbag Filter TDT Passive				11.
Sample Labels Match COC?	(☑ Yes)	☐ No	☐ N/A	12.

Samples Received:

Canisters			Canisters		
Sample Number	Can ID	Flow Controller ID	Sample Number	Can ID	Flow Controller ID
E-1	2841	0910			
E-2	2276	0790			
E-3	1330	0686			

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: _____ Date/Time: _____

Comments/Resolution: _____

Project Manager Review: Kyla Xiong **Date:** 11/19/15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

May 21, 2015

Kelly Jaworski
Wenck
1800 Pioneer Creek Cente
Maple Plain, MN 55359

RE: Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Dear Kelly Jaworski:
Enclosed are the analytical results for sample(s) received by the laboratory on May 08, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kabor Xiong

Kabor Xiong
kabor.xiong@pacelabs.com
Project Manager

Enclosures

cc: Adam P. Zobel, Wenck Associates, Inc

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CERTIFICATIONS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: MW-1 **Lab ID: 10305683001** Collected: 05/08/15 05:05 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**1.6**	mg/L	0.11	1	05/12/15 14:03	05/14/15 13:12		T6,T7
Surrogates								
n-Triacontane (S)	96	%.	50-150	1	05/12/15 14:03	05/14/15 13:12	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		05/20/15 11:11	71-43-2	
Ethylbenzene	**16.6**	ug/L	1.0	1		05/20/15 11:11	100-41-4	
Gasoline Range Organics	**1530**	ug/L	100	1		05/20/15 11:11		
Toluene	ND	ug/L	1.0	1		05/20/15 11:11	108-88-3	
Xylene (Total)	**595**	ug/L	3.0	1		05/20/15 11:11	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	107	%.	80-150	1		05/20/15 11:11	98-08-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: MW-3 **Lab ID: 10305683002** Collected: 05/08/15 04:30 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**12.4**	mg/L	1.1	10	05/12/15 14:03	05/14/15 16:18		T7
Surrogates								
n-Triacontane (S)	37	%.	50-150	10	05/12/15 14:03	05/14/15 16:18	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**1860**	ug/L	25.0	25		05/21/15 11:42	71-43-2	
Ethylbenzene	**42.1**	ug/L	1.0	1		05/20/15 11:35	100-41-4	IU
Gasoline Range Organics	**17300**	ug/L	2500	25		05/21/15 11:42		
Toluene	**1320**	ug/L	25.0	25		05/21/15 11:42	108-88-3	
Xylene (Total)	**4590**	ug/L	75.0	25		05/21/15 11:42	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	142	%.	80-150	1		05/20/15 11:35	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: MW-6 **Lab ID: 10305683003** Collected: 05/08/15 12:15 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**5.7**	mg/L	0.51	5	05/12/15 14:03	05/14/15 16:33		T7
Surrogates								
n-Triacontane (S)	85	%.	50-150	5	05/12/15 14:03	05/14/15 16:33	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2500**	ug/L	50.0	50		05/21/15 12:06	71-43-2	
Ethylbenzene	**953**	ug/L	50.0	50		05/21/15 12:06	100-41-4	
Gasoline Range Organics	**15400**	ug/L	5000	50		05/21/15 12:06		
Toluene	**2480**	ug/L	50.0	50		05/21/15 12:06	108-88-3	
Xylene (Total)	**4250**	ug/L	150	50		05/21/15 12:06	1330-20-7	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: MW-7 **Lab ID: 10305683004** Collected: 05/08/15 13:03 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**11.1**	mg/L	1.1	10	05/12/15 14:03	05/14/15 15:54		T7
Surrogates								
n-Triacontane (S)	77	%.	50-150	10	05/12/15 14:03	05/14/15 15:54	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2440**	ug/L	50.0	50		05/21/15 12:30	71-43-2	
Ethylbenzene	**1360**	ug/L	50.0	50		05/21/15 12:30	100-41-4	
Gasoline Range Organics	**28100**	ug/L	5000	50		05/21/15 12:30		
Toluene	**5760**	ug/L	50.0	50		05/21/15 12:30	108-88-3	
Xylene (Total)	**7610**	ug/L	150	50		05/21/15 12:30	1330-20-7	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: MW-8 **Lab ID: 10305683005** Collected: 05/08/15 14:10 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**13.1**	mg/L	1.1	10	05/12/15 14:03	05/14/15 16:02		T7
Surrogates								
n-Triacontane (S)	73	%.	50-150	10	05/12/15 14:03	05/14/15 16:02	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**148**	ug/L	1.0	1		05/20/15 12:46	71-43-2	
Ethylbenzene	**61.4**	ug/L	1.0	1		05/20/15 12:46	100-41-4	
Gasoline Range Organics	**12900**	ug/L	1000	10		05/21/15 12:53		
Toluene	**243**	ug/L	1.0	1		05/20/15 12:46	108-88-3	
Xylene (Total)	**251**	ug/L	3.0	1		05/20/15 12:46	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	46	%.	80-150	1		05/20/15 12:46	98-08-8	IU,S2

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: MW-9 **Lab ID: 10305683006** Collected: 05/08/15 14:55 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**7.6**	mg/L	1.1	10	05/12/15 14:03	05/14/15 16:10		T7
Surrogates								
n-Triacontane (S)	79	%.	50-150	10	05/12/15 14:03	05/14/15 16:10	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**1900**	ug/L	25.0	25		05/21/15 13:17	71-43-2	
Ethylbenzene	**1130**	ug/L	25.0	25		05/21/15 13:17	100-41-4	
Gasoline Range Organics	**20600**	ug/L	2500	25		05/21/15 13:17		
Toluene	**2300**	ug/L	25.0	25		05/21/15 13:17	108-88-3	
Xylene (Total)	**7270**	ug/L	75.0	25		05/21/15 13:17	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	159	%.	80-150	1		05/20/15 13:10	98-08-8	S0

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: MW-10 **Lab ID: 10305683007** Collected: 05/08/15 11:15 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**4.4**	mg/L	0.11	1	05/12/15 14:03	05/14/15 14:06		T6,T7
Surrogates								
n-Triacontane (S)	91	%.	50-150	1	05/12/15 14:03	05/14/15 14:06	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**212**	ug/L	1.0	1		05/20/15 13:33	71-43-2	
Ethylbenzene	**246**	ug/L	1.0	1		05/20/15 13:33	100-41-4	
Gasoline Range Organics	**7580**	ug/L	500	5		05/21/15 13:41		
Toluene	**229**	ug/L	1.0	1		05/20/15 13:33	108-88-3	
Xylene (Total)	**1030**	ug/L	3.0	1		05/20/15 13:33	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	110	%.	80-150	1		05/20/15 13:33	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: MW-11 **Lab ID: 10305683008** Collected: 05/08/15 10:20 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	ND	mg/L	0.12	1	05/12/15 14:03	05/14/15 14:45		
Surrogates								
n-Triacontane (S)	91	%.	50-150	1	05/12/15 14:03	05/14/15 14:45	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		05/20/15 13:57	71-43-2	
Ethylbenzene	ND	ug/L	1.0	1		05/20/15 13:57	100-41-4	
Gasoline Range Organics	ND	ug/L	100	1		05/20/15 13:57		
Toluene	ND	ug/L	1.0	1		05/20/15 13:57	108-88-3	
Xylene (Total)	**4.4**	ug/L	3.0	1		05/20/15 13:57	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	98	%.	80-150	1		05/20/15 13:57	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Sample: Duplicate-1 **Lab ID: 10305683010** Collected: 05/08/15 00:00 Received: 05/08/15 18:26 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**9.6**	mg/L	1.1	10	05/12/15 14:03	05/14/15 15:47		T7
Surrogates								
n-Triacontane (S)	81	%.	50-150	10	05/12/15 14:03	05/14/15 15:47	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2090**	ug/L	50.0	50		05/21/15 14:04	71-43-2	
Ethylbenzene	**1140**	ug/L	50.0	50		05/21/15 14:04	100-41-4	
Gasoline Range Organics	**23600**	ug/L	5000	50		05/21/15 14:04		
Toluene	**2470**	ug/L	50.0	50		05/21/15 14:04	108-88-3	
Xylene (Total)	**7350**	ug/L	150	50		05/21/15 14:04	1330-20-7	

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QUALITY CONTROL DATA

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

QC Batch: GCV/13756 Analysis Method: WI MOD GRO
QC Batch Method: WI MOD GRO Analysis Description: WIGRO GCV Water
Associated Lab Samples: 10305683001, 10305683002, 10305683003, 10305683004, 10305683005, 10305683006, 10305683007, 10305683008, 10305683010

METHOD BLANK: 1970465 Matrix: Water
Associated Lab Samples: 10305683001, 10305683002, 10305683003, 10305683004, 10305683005, 10305683006, 10305683007, 10305683008, 10305683010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	05/20/15 10:48	
Ethylbenzene	ug/L	ND	1.0	05/20/15 10:48	
Gasoline Range Organics	ug/L	ND	100	05/20/15 10:48	
Toluene	ug/L	ND	1.0	05/20/15 10:48	
Xylene (Total)	ug/L	ND	3.0	05/20/15 10:48	
a,a,a-Trifluorotoluene (S)	%.	96	80-150	05/20/15 10:48	

LABORATORY CONTROL SAMPLE & LCSD: 1970466 1970467

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Benzene	ug/L	100	110	92.3	110	92	80-120	17	20	
Ethylbenzene	ug/L	100	117	96.9	117	97	80-120	19	20	
Gasoline Range Organics	ug/L	1000	1140	994	114	99	80-120	14	20	
Toluene	ug/L	100	119	99.1	119	99	80-120	18	20	
Xylene (Total)	ug/L	300	351	291	117	97	80-120	19	20	
a,a,a-Trifluorotoluene (S)	%.				97	107	80-150			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

QC Batch: OEXT/29142 Analysis Method: WI MOD DRO
QC Batch Method: WI MOD DRO Analysis Description: WIDRO GCS
Associated Lab Samples: 10305683001, 10305683002, 10305683003, 10305683004, 10305683005, 10305683006, 10305683007, 10305683008, 10305683010

METHOD BLANK: 1962795 Matrix: Water
Associated Lab Samples: 10305683001, 10305683002, 10305683003, 10305683004, 10305683005, 10305683006, 10305683007, 10305683008, 10305683010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
WDRO C10-C28	mg/L	ND	0.10	05/14/15 12:57	
n-Triacontane (S)	%.	86	50-150	05/14/15 12:57	

LABORATORY CONTROL SAMPLE & LCSD: 1962796 1962797

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
WDRO C10-C28	mg/L	2	1.8	1.9	88	95	75-115	8	20	
n-Triacontane (S)	%.				86	95	50-150			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

IU	The internal standard recoveries associated with this sample exceed the upper control limit. The reported results should be considered estimated values.
S0	Surrogate recovery outside laboratory control limits.
S2	Surrogate recovery outside laboratory control limits due to matrix interferences (confirmed by similar results from sample re-analysis).
S4	Surrogate recovery not evaluated against control limits due to sample dilution.
T6	High boiling point hydrocarbons are present in the sample.
T7	Low boiling point hydrocarbons are present in the sample.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 3228-01 Former Union 76
Pace Project No.: 10305683

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10305683001	**MW-1**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683002	**MW-3**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683003	**MW-6**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683004	**MW-7**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683005	**MW-8**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683006	**MW-9**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683007	**MW-10**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683008	**MW-11**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683010	**Duplicate-1**	WI MOD DRO	OEXT/29142	WI MOD DRO	GCSV/15688
10305683001	**MW-1**	WI MOD GRO	GCV/13756		
10305683002	**MW-3**	WI MOD GRO	GCV/13756		
10305683003	**MW-6**	WI MOD GRO	GCV/13756		
10305683004	**MW-7**	WI MOD GRO	GCV/13756		
10305683005	**MW-8**	WI MOD GRO	GCV/13756		
10305683006	**MW-9**	WI MOD GRO	GCV/13756		
10305683007	**MW-10**	WI MOD GRO	GCV/13756		
10305683008	**MW-11**	WI MOD GRO	GCV/13756		
10305683010	**Duplicate-1**	WI MOD GRO	GCV/13756		

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CHAIN-OF-CUSTODY / Analytical Request Document

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www.pacelabs.com

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

10305683

Page: | of |

1714345

Section A Required Client Information:

Company:	Wenck Associates
Address:	1802 Wooddale Dr
	Woodbury MN
Email To:	Kmiller@wenck.com
Phone:	(651)-395-5220 Fax:
Requested Due Date/TAT:	STAT

Section B Required Project Information:

Report To:	Katie Miller
Copy To:	a Zobel@wenck.com
Purchase Order No.:	
Project Name:	Former Union 76
Project Number:	3228-01

Section C Invoice Information:

Attention:	Wenck AP
Company Name:	Wenck Associates
Address:	1800 Pioneer Cr Suite, MN
Pace Quote Reference:	
Pace Project Manager:	
Pace Profile #:	

REGULATORY AGENCY

NPDES ☒ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: Cambridge MN

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

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	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	Analysis Test Y/N	DRO (WI Method)	GRO/BTEX (8260)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MW-1	WT	G	5/8/15	5:05				5				X					N	X	X		001
2	MW-3	WT	G	5/8/15	4:30				5				X						X	X		002
3	MW-6	WT	G	5/8/15	12:15				5				X						X	X		003
4	MW-7	WT	G	"	1:05				5				X						X	X		004
5	MW-8	WT	G	"	2:10				5				X						X	X		005
6	MW-9	WT	G	"	2:55				5				X						X	X		006
7	MW-10	WT	G	"	11:15				5				X						X	X		007
8	MW-11	WT	G	"	10:20				5				X						X	X		008
9	Trip Blank												X						X			BTEX Only 009
10	Duplicate-1	WT	G	5/8/15					5				X						X	X		010
11																						
12																						

One chain — two coolers

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Petrofund/RI EDD	Katie Miller/Wenck	5/8/15	6:26	[illegible] Pace	5-8-15	1826

SAMPLE CONDITIONS

1-2	Y	N	Y
2-1			

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Kathryn Miller

SIGNATURE of SAMPLER: Katie Miller DATE Signed (MM/DD/YY): 5/8/15

ORIGINAL

*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.

F-ALL-Q-020rev.07, 15-May-2007

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 23Feb2015 Page 1 of 1
	Document No.: F-MN-L-213-rev.13	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck & Associates

Project #: WO# : 10305683

10305683

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace ☐ SpeeDee ☐ Other:

Tracking Number:

Custody Seal on Cooler/Box Present? ☐ Yes ☑ No **Seals Intact?** ☐ Yes ☑ No **Optional:** Proj. Due Date: Proj. Name:

Packing Material: ☑ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other: **Temp Blank?** ☑ Yes ☐ No

Thermometer Used: ☐ B88A9130516413 ☐ B88A912167504 ☑ B88A0143310098 **Type of Ice:** ☑ Wet ☐ Blue ☐ None ☐ Samples on ice, cooling process has begun

Cooler Temp Read (°C): 0.7, 1.6 **Cooler Temp Corrected (°C):** 1.2, 2.1 **Biological Tissue Frozen?** ☐ Yes ☐ No ☑ N/A

Temp should be above freezing to 6°C **Correction Factor:** +0.5 **Date and Initials of Person Examining Contents:** KAC 05/08/15

USDA Regulated Soil (☑ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, AZ, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or WA (check maps)? ☐ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☐ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present?	☑ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☑ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☑ Yes	☐ No	☐ N/A	3.
Sampler Name and/or Signature on COC?	☑ Yes	☐ No	☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☑ No	☐ N/A	7.
Sufficient Volume?	☑ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☑ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☑ Yes	☐ No	☐ N/A	
Containers Intact?	☑ Yes	☐ No	☐ N/A	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes	☐ No	☑ N/A	11. Note if sediment is visible in the dissolved container
Sample Labels Match COC?	☑ Yes	☐ No	☐ N/A	12.
-Includes Date/Time/ID/Analysis Matrix: WT				
All containers needing acid/base preservation have been checked?	☐ Yes	☐ No	☑ N/A	13. ☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ HCl
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, HCl<2; NaOH >9 Sulfide, NaOH>12 Cyanide)	☐ Yes	☐ No	☑ N/A	Sample #
Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC	☑ Yes	☐ No	☐ N/A	Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☑ Yes	☐ No	☐ N/A	14. in one of the MW-3 vials
Trip Blank Present?	☑ Yes	☐ No	☐ N/A	15.
Trip Blank Custody Seals Present?	☑ Yes	☐ No	☐ N/A	
Pace Trip Blank Lot # (if purchased): 042015-01				

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: Date/Time:

Comments/Resolution:

Project Manager Review: Date: 05/11/15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

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August 24, 2015

Adam P. Zobel
Wenck Associates, Inc
1800 Pioneer Creek Center
P.O. BOX 249
Maple Plain, MN 55359

RE: Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Dear Adam Zobel:
Enclosed are the analytical results for sample(s) received by the laboratory on August 13, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

This report was revised on August 24, 2015 to remove VOC analysis and report GRO/BTEX by WI GRO.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kabor Xiong

Kabor Xiong
kabor.xiong@pacelabs.com
Project Manager

Enclosures

cc: Todd Fryzek, Wenck Associates

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CERTIFICATIONS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: MW-1 **Lab ID: 10318160001** Collected: 08/13/15 04:00 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**1.5**	mg/L	0.11	1	08/14/15 14:32	08/18/15 13:58		T6,T7
Surrogates								
n-Triacontane (S)	113	%.	50-150	1	08/14/15 14:32	08/18/15 13:58	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		08/20/15 19:20	71-43-2	
Ethylbenzene	**11.8**	ug/L	1.0	1		08/20/15 19:20	100-41-4	
Gasoline Range Organics	**1140**	ug/L	100	1		08/20/15 19:20		
Toluene	ND	ug/L	1.0	1		08/20/15 19:20	108-88-3	
Xylene (Total)	**409**	ug/L	3.0	1		08/20/15 19:20	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	109	%.	80-150	1		08/20/15 19:20	98-08-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: MW-3 **Lab ID: 10318160002** Collected: 08/13/15 03:30 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**16.4**	mg/L	2.2	20	08/18/15 17:36	08/20/15 11:10		T7
Surrogates								
n-Triacontane (S)	0	%.	50-150	20	08/18/15 17:36	08/20/15 11:10	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2210**	ug/L	10.0	10		08/20/15 14:59	71-43-2	
Ethylbenzene	**115**	ug/L	10.0	10		08/20/15 14:59	100-41-4	
Gasoline Range Organics	**21700**	ug/L	1000	10		08/20/15 14:59		
Toluene	**1650**	ug/L	10.0	10		08/20/15 14:59	108-88-3	
Xylene (Total)	**5460**	ug/L	30.0	10		08/20/15 14:59	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	95	%.	80-150	10		08/20/15 14:59	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: MW-8 **Lab ID: 10318160003** Collected: 08/13/15 02:30 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**11.2**	mg/L	2.4	20	08/18/15 17:36	08/20/15 11:03		T7
Surrogates								
n-Triacontane (S)	0	%.	50-150	20	08/18/15 17:36	08/20/15 11:03	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**843**	ug/L	10.0	10		08/20/15 15:23	71-43-2	
Ethylbenzene	**398**	ug/L	10.0	10		08/20/15 15:23	100-41-4	
Gasoline Range Organics	**12300**	ug/L	1000	10		08/20/15 15:23		
Toluene	**1610**	ug/L	10.0	10		08/20/15 15:23	108-88-3	
Xylene (Total)	**1830**	ug/L	30.0	10		08/20/15 15:23	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	98	%.	80-150	10		08/20/15 15:23	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: MW-7 **Lab ID: 10318160004** Collected: 08/13/15 02:00 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**10.7**	mg/L	2.2	20	08/18/15 17:36	08/20/15 11:16		T7
Surrogates								
n-Triacontane (S)	0	%.	50-150	20	08/18/15 17:36	08/20/15 11:16	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**3600**	ug/L	50.0	50		08/20/15 14:11	71-43-2	
Ethylbenzene	**1830**	ug/L	50.0	50		08/20/15 14:11	100-41-4	
Gasoline Range Organics	**37000**	ug/L	5000	50		08/20/15 14:11		
Toluene	**7650**	ug/L	50.0	50		08/20/15 14:11	108-88-3	
Xylene (Total)	**10100**	ug/L	150	50		08/20/15 14:11	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	107	%.	80-150	50		08/20/15 14:11	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: MW-9 **Lab ID: 10318160005** Collected: 08/13/15 01:20 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**7.5**	mg/L	2.3	20	08/18/15 17:36	08/20/15 10:56		T7
Surrogates								
n-Triacontane (S)	0	%.	50-150	20	08/18/15 17:36	08/20/15 10:56	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2700**	ug/L	10.0	10		08/20/15 15:46	71-43-2	
Ethylbenzene	**1190**	ug/L	10.0	10		08/20/15 15:46	100-41-4	
Gasoline Range Organics	**27900**	ug/L	1000	10		08/20/15 15:46		
Toluene	**3880**	ug/L	10.0	10		08/20/15 15:46	108-88-3	
Xylene (Total)	**7270**	ug/L	30.0	10		08/20/15 15:46	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	110	%.	80-150	10		08/20/15 15:46	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: MW-6A **Lab ID: 10318160006** Collected: 08/13/15 12:45 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**0.13**	mg/L	0.11	1	08/18/15 17:36	08/20/15 12:51		
Surrogates								
n-Triacontane (S)	82	%.	50-150	1	08/18/15 17:36	08/20/15 12:51	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		08/19/15 05:34	71-43-2	
Ethylbenzene	ND	ug/L	1.0	1		08/19/15 05:34	100-41-4	
Gasoline Range Organics	ND	ug/L	100	1		08/19/15 05:34		
Toluene	ND	ug/L	1.0	1		08/19/15 05:34	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		08/19/15 05:34	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	96	%.	80-150	1		08/19/15 05:34	98-08-8	pH

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: MW-6 **Lab ID: 10318160007** Collected: 08/13/15 11:00 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**3.6**	mg/L	1.2	10	08/18/15 17:36	08/20/15 11:43		T7
Surrogates								
n-Triacontane (S)	76	%.	50-150	10	08/18/15 17:36	08/20/15 11:43	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2420**	ug/L	10.0	10		08/20/15 16:10	71-43-2	
Ethylbenzene	**968**	ug/L	10.0	10		08/20/15 16:10	100-41-4	
Gasoline Range Organics	**18300**	ug/L	1000	10		08/20/15 16:10		
Toluene	**2750**	ug/L	10.0	10		08/20/15 16:10	108-88-3	
Xylene (Total)	**3920**	ug/L	30.0	10		08/20/15 16:10	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	91	%.	80-150	10		08/20/15 16:10	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: MW-10 **Lab ID: 10318160008** Collected: 08/13/15 10:15 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**3.4**	mg/L	2.0	20	08/18/15 17:36	08/20/15 11:23		T7
Surrogates								
n-Triacontane (S)	0	%.	50-150	20	08/18/15 17:36	08/20/15 11:23	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**229**	ug/L	10.0	10		08/20/15 16:34	71-43-2	
Ethylbenzene	**366**	ug/L	10.0	10		08/20/15 16:34	100-41-4	
Gasoline Range Organics	**8140**	ug/L	1000	10		08/20/15 16:34		
Toluene	**238**	ug/L	10.0	10		08/20/15 16:34	108-88-3	
Xylene (Total)	**1620**	ug/L	30.0	10		08/20/15 16:34	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	78	%.	80-150	10		08/20/15 16:34	98-08-8	S1

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ANALYTICAL RESULTS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Sample: Trip Blank **Lab ID: 10318160009** Collected: 08/13/15 00:00 Received: 08/13/15 17:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		08/18/15 21:40	71-43-2	
Ethylbenzene	ND	ug/L	1.0	1		08/18/15 21:40	100-41-4	
Gasoline Range Organics	ND	ug/L	100	1		08/18/15 21:40		
Toluene	ND	ug/L	1.0	1		08/18/15 21:40	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		08/18/15 21:40	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	108	%.	80-150	1		08/18/15 21:40	98-08-8	

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QUALITY CONTROL DATA

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

QC Batch: GCV/14261 Analysis Method: WI MOD GRO
QC Batch Method: WI MOD GRO Analysis Description: WIGRO GCV Water
Associated Lab Samples: 10318160006, 10318160009

METHOD BLANK: 2052247 Matrix: Water
Associated Lab Samples: 10318160006, 10318160009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	08/18/15 21:16	
Ethylbenzene	ug/L	ND	1.0	08/18/15 21:16	
Gasoline Range Organics	ug/L	ND	100	08/18/15 21:16	
Toluene	ug/L	ND	1.0	08/18/15 21:16	
Xylene (Total)	ug/L	ND	3.0	08/18/15 21:16	
a,a,a-Trifluorotoluene (S)	%.	111	80-150	08/18/15 21:16	

LABORATORY CONTROL SAMPLE & LCSD: 2052248 2052249

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Benzene	ug/L	100	115	99.7	115	100	80-120	14	20	CH
Ethylbenzene	ug/L	100	118	104	118	104	80-120	13	20	CH
Gasoline Range Organics	ug/L	1000	1060	1020	106	102	80-120	4	20	
Toluene	ug/L	100	111	99.7	111	100	80-120	11	20	
Xylene (Total)	ug/L	300	344	303	115	101	80-120	13	20	
a,a,a-Trifluorotoluene (S)	%.				108	116	80-150			

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QUALITY CONTROL DATA

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

QC Batch: GCV/14274 Analysis Method: WI MOD GRO
QC Batch Method: WI MOD GRO Analysis Description: WIGRO GCV Water
Associated Lab Samples: 10318160001, 10318160002, 10318160003, 10318160004, 10318160005, 10318160007, 10318160008

METHOD BLANK: 2054565 Matrix: Water
Associated Lab Samples: 10318160001, 10318160002, 10318160003, 10318160004, 10318160005, 10318160007, 10318160008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	08/20/15 12:12	
Ethylbenzene	ug/L	ND	1.0	08/20/15 12:12	
Gasoline Range Organics	ug/L	ND	100	08/20/15 12:12	
Toluene	ug/L	ND	1.0	08/20/15 12:12	
Xylene (Total)	ug/L	ND	3.0	08/20/15 12:12	
a,a,a-Trifluorotoluene (S)	%.	113	80-150	08/20/15 12:12	

LABORATORY CONTROL SAMPLE & LCSD: 2054566 2054567

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Benzene	ug/L	100	101	103	101	103	80-120	1	20	
Ethylbenzene	ug/L	100	104	108	104	108	80-120	3	20	
Gasoline Range Organics	ug/L	1000	1010	1080	101	108	80-120	7	20	
Toluene	ug/L	100	97.7	103	98	103	80-120	5	20	
Xylene (Total)	ug/L	300	305	311	102	104	80-120	2	20	
a,a,a-Trifluorotoluene (S)	%.				104	112	80-150			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2054568 2054569

Parameter	Units	10317499003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Qual
Benzene	ug/L	1.1	100	100	109	113	107	112	80-120	4	
Ethylbenzene	ug/L	ND	100	100	111	114	111	114	80-120	2	
Gasoline Range Organics	ug/L	ND	1000	1000	1110	1110	111	111	80-120	0	
Toluene	ug/L	ND	100	100	107	107	107	107	80-120	0	
Xylene (Total)	ug/L	ND	300	300	325	336	108	112	80-120	3	
a,a,a-Trifluorotoluene (S)	%.						104	103	80-150		

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QUALITY CONTROL DATA

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

QC Batch: OEXT/30389 Analysis Method: WI MOD DRO
QC Batch Method: WI MOD DRO Analysis Description: WIDRO GCS
Associated Lab Samples: 10318160001

METHOD BLANK: 2050648 Matrix: Water
Associated Lab Samples: 10318160001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
WDRO C10-C28	mg/L	ND	0.10	08/18/15 13:45	
n-Triacontane (S)	%.	85	50-150	08/18/15 13:45	

LABORATORY CONTROL SAMPLE & LCSD: 2050649 2050650

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
WDRO C10-C28	mg/L	2	1.7	2.0	86	101	75-115	16	20	
n-Triacontane (S)	%.				90	104	50-150			

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QUALITY CONTROL DATA

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

QC Batch: OEXT/30427 Analysis Method: WI MOD DRO
QC Batch Method: WI MOD DRO Analysis Description: WIDRO GCS
Associated Lab Samples: 10318160002, 10318160003, 10318160004, 10318160005, 10318160006, 10318160007, 10318160008

METHOD BLANK: 2052898 Matrix: Water
Associated Lab Samples: 10318160002, 10318160003, 10318160004, 10318160005, 10318160006, 10318160007, 10318160008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
WDRO C10-C28	mg/L	ND	0.10	08/20/15 10:36	
n-Triacontane (S)	%.	95	50-150	08/20/15 10:36	

LABORATORY CONTROL SAMPLE & LCSD: 2052899 2052900

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
WDRO C10-C28	mg/L	2	1.5	1.8	77	90	75-115	15	20	
n-Triacontane (S)	%.				80	89	50-150			

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QUALIFIERS

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

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TNI - The NELAC Institute.

BATCH QUALIFIERS

Batch: GCV/14261

[M5]	A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

CH	The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased high.
S1	Surrogate recovery outside laboratory control limits (confirmed by re-analysis).
S4	Surrogate recovery not evaluated against control limits due to sample dilution.
T6	High boiling point hydrocarbons are present in the sample.
T7	Low boiling point hydrocarbons are present in the sample.
pH	Post-analysis pH measurement indicates insufficient VOA sample preservation.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 3228-01 Former Union 76-REV
Pace Project No.: 10318160

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10318160001	**MW-1**	WI MOD DRO	OEXT/30389	WI MOD DRO	GCSV/16471
10318160002	**MW-3**	WI MOD DRO	OEXT/30427	WI MOD DRO	GCSV/16489
10318160003	**MW-8**	WI MOD DRO	OEXT/30427	WI MOD DRO	GCSV/16489
10318160004	**MW-7**	WI MOD DRO	OEXT/30427	WI MOD DRO	GCSV/16489
10318160005	**MW-9**	WI MOD DRO	OEXT/30427	WI MOD DRO	GCSV/16489
10318160006	**MW-6A**	WI MOD DRO	OEXT/30427	WI MOD DRO	GCSV/16489
10318160007	**MW-6**	WI MOD DRO	OEXT/30427	WI MOD DRO	GCSV/16489
10318160008	**MW-10**	WI MOD DRO	OEXT/30427	WI MOD DRO	GCSV/16489
10318160001	**MW-1**	WI MOD GRO	GCV/14274		
10318160002	**MW-3**	WI MOD GRO	GCV/14274		
10318160003	**MW-8**	WI MOD GRO	GCV/14274		
10318160004	**MW-7**	WI MOD GRO	GCV/14274		
10318160005	**MW-9**	WI MOD GRO	GCV/14274		
10318160006	**MW-6A**	WI MOD GRO	GCV/14261		
10318160007	**MW-6**	WI MOD GRO	GCV/14274		
10318160008	**MW-10**	WI MOD GRO	GCV/14274		
10318160009	**Trip Blank**	WI MOD GRO	GCV/14261		

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CHAIN-OF-CUSTODY / Analytical Request Document

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The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

0318160

Page: 1 of 1

1986162

Section A Required Client Information:

Company: Wenck Associates
Address: 1802 Woodale Dr
Woodbury MN
Email To: kmiller@wenck.com
Phone: 651-295-5228 Fax:
Requested Due Date/TAT: STAT

Section B Required Project Information:

Report To: Katie Miller
Copy To: aZobel@wenck.com
Purchase Order No.:
Project Name: Former Union 76
Project Number: 3228-01

Section C Invoice Information:

Attention: Wenck AP
Company Name: Wenck Associates
Address: Maple Plain MN
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY: ☐ NPDES ☒ GROUND WATER ☐ DRINKING WATER ☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: Cambridge MN

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 #	SAMPLE ID	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	Analysis Test Y/N	DRO w/ Method 3510/BTEX (8260)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MW-1	WT	G	8/13/15	4:00								X					X	X		001
2	MW-3				3:30								X					X	X		002
3	MW-8				2:30								X					X	X		003
4	MW-7				2:00								X					X	X		004
5	MW-9				1:20								X					X	X		005
6	MW-6A				12:45								X					X	X		006
7	MW-6				11:00								X					X	X		007
8	MW-10				10:15								X					X	X		008
9	Trip Blank																		X		BTEX only 009
10																					
11																					
12																					

One Chain two Coolers

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PetroFund RI EDD	Katie Miller Wenck	8/13/15	5:30	[signature] PACE	8/13/15	1730	1.9	Y	N	Y
One chain, 2 coolers							1.5	Y	N	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Kathryn Miller

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 8/13/15

*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.

F-ALL-Q-020rev.07, 15-May-2007

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 23Feb2015 Page 1 of 1
	Document No.: F-MN-L-213-rev.13	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck **Project #:** WO#: 10318160

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace ☐ SpeeDee ☐ Other:

Tracking Number:

Custody Seal on Cooler/Box Present? ☐ Yes ☑ No **Seals Intact?** ☐ Yes ☑ No **Optional:** Proj. Due Date: Proj. Name:

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other: **Temp Blank?** ☑ Yes ☐ No

Thermometer Used: ☐ B88A9130516413 ☑ B88A912167504 ☐ B88A0143310098 **Type of Ice:** ☑ Wet ☐ Blue ☐ None ☑ Samples on ice, cooling process has begun

Cooler Temp Read (°C): 1.9, 17.5 **Cooler Temp Corrected (°C):** 1.9, 17.5 **Biological Tissue Frozen?** ☐ Yes ☐ No ☑ N/A

Temp should be above freezing to 6°C **Correction Factor:** 0.0 **Date and Initials of Person Examining Contents:** KH 8/13/15

USDA Regulated Soil (☑ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, AZ, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or WA (check maps)? ☐ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☐ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present?	☑ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☑ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☑ Yes	☐ No	☐ N/A	3.
Sampler Name and/or Signature on COC?	☑ Yes	☐ No	☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☑ No	☐ N/A	7.
Sufficient Volume?	☑ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☑ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☑ Yes	☐ No	☐ N/A	
Containers Intact?	☑ Yes	☐ No	☐ N/A	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes	☐ No	☑ N/A	11. Note if sediment is visible in the dissolved container
Sample Labels Match COC? -Includes Date/Time/ID/Analysis Matrix: WT	☑ Yes	☐ No	☐ N/A	12.
All containers needing acid/base preservation have been checked?	☐ Yes	☐ No	☑ N/A	13. ☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ HCl Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, HCl<2; NaOH >9 Sulfide, NaOH>12 Cyanide) Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC	☐ Yes	☐ No	☑ N/A	Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☑ Yes	☐ No	☐ N/A	14. 1/6 MW9, 1/6 MW6A
Trip Blank Present?	☑ Yes	☐ No	☐ N/A	15.
Trip Blank Custody Seals Present?	☑ Yes	☐ No	☐ N/A	
Pace Trip Blank Lot # (if purchased): 081115-01				

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: Date/Time:

Comments/Resolution:

Project Manager Review: AMA **Date:** 8/17/15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

November 10, 2015

Adam P. Zobel
Wenck Associates, Inc
1800 Pioneer Creek Center
P.O. BOX 249
Maple Plain, MN 55359

RE: Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Dear Adam Zobel:
Enclosed are the analytical results for sample(s) received by the laboratory on November 04, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kabor Xiong
kabor.xiong@pacelabs.com
Project Manager

Enclosures

cc: Cory J. Anderson, Wenck Associates

REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

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PROJECT NARRATIVE

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Date: November 10, 2015

The GRO values for sample 10328800001 (MW-1) appear to indicate that the vials were non-homogenous. The highest value was reported to present the highest risk data.

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PROJECT NARRATIVE

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Method: **WI MOD DRO**
Description: WIDRO GCS
Client: Wenck Associates, Inc.
Date: November 10, 2015

General Information:
9 samples were analyzed for WI MOD DRO. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with WI MOD DRO with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: OEXT/31544

T7: Low boiling point hydrocarbons are present in the sample.

- DUPLICATE (Lab ID: 10328800009)
  - WDRO C10-C28
- MW-1 (Lab ID: 10328800001)
  - WDRO C10-C28
- MW-10 (Lab ID: 10328800003)
  - WDRO C10-C28
- MW-3 (Lab ID: 10328800008)
  - WDRO C10-C28
- MW-6 (Lab ID: 10328800004)
  - WDRO C10-C28

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PROJECT NARRATIVE

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Method: **WI MOD DRO**
Description: WIDRO GCS
Client: Wenck Associates, Inc.
Date: November 10, 2015

Analyte Comments:

QC Batch: OEXT/31544

T7: Low boiling point hydrocarbons are present in the sample.

- MW-7 (Lab ID: 10328800007)
  - WDRO C10-C28
- MW-8 (Lab ID: 10328800006)
  - WDRO C10-C28
- MW-9 (Lab ID: 10328800005)
  - WDRO C10-C28

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PROJECT NARRATIVE

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Method: **WI MOD GRO**
Description: WIGRO GCV
Client: Wenck Associates, Inc.
Date: November 10, 2015

General Information:
10 samples were analyzed for WI MOD GRO. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: GCV/14602

1M: Results for sample10328800001 appear to indicate that the vials were non-homogenous. The highest value was reported to present the highest risk data.

- MW-1 (Lab ID: 10328800001)
  - a,a,a-Trifluorotoluene (S)

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: MW-1 **Lab ID: 10328800001** Collected: 11/03/15 10:20 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**2.1**	mg/L	0.11	1	11/05/15 12:14	11/07/15 12:22		T7
Surrogates								
n-Triacontane (S)	81	%.	50-150	1	11/05/15 12:14	11/07/15 12:22	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		11/05/15 22:11	71-43-2	
Ethylbenzene	**27.2**	ug/L	2.5	1		11/05/15 22:11	100-41-4	
Gasoline Range Organics	**2780**	ug/L	100	1		11/05/15 22:11		
Toluene	ND	ug/L	2.5	1		11/05/15 22:11	108-88-3	
Xylene (Total)	**920**	ug/L	3.0	1		11/05/15 22:11	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	104	%.	80-150	1		11/05/15 22:11	98-08-8	1M,D6

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: MW-11 **Lab ID: 10328800002** Collected: 11/03/15 10:45 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	ND	mg/L	0.11	1	11/05/15 12:14	11/07/15 13:40		
Surrogates								
n-Triacontane (S)	83	%.	50-150	1	11/05/15 12:14	11/07/15 13:40	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		11/05/15 22:35	71-43-2	
Ethylbenzene	ND	ug/L	2.5	1		11/05/15 22:35	100-41-4	
Gasoline Range Organics	ND	ug/L	100	1		11/05/15 22:35		
Toluene	ND	ug/L	2.5	1		11/05/15 22:35	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		11/05/15 22:35	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	96	%.	80-150	1		11/05/15 22:35	98-08-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: MW-10 **Lab ID: 10328800003** Collected: 11/03/15 11:05 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**3.4**	mg/L	0.11	1	11/05/15 12:14	11/07/15 12:30		T7
Surrogates								
n-Triacontane (S)	77	%.	50-150	1	11/05/15 12:14	11/07/15 12:30	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**279**	ug/L	10.0	10		11/06/15 15:57	71-43-2	
Ethylbenzene	**342**	ug/L	25.0	10		11/06/15 15:57	100-41-4	
Gasoline Range Organics	**7590**	ug/L	1000	10		11/06/15 15:57		
Toluene	**182**	ug/L	25.0	10		11/06/15 15:57	108-88-3	
Xylene (Total)	**1320**	ug/L	30.0	10		11/06/15 15:57	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	103	%.	80-150	10		11/06/15 15:57	98-08-8	

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: MW-6 **Lab ID: 10328800004** Collected: 11/03/15 12:03 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**4.7**	mg/L	0.11	1	11/05/15 12:14	11/07/15 12:38		T7
Surrogates								
n-Triacontane (S)	79	%.	50-150	1	11/05/15 12:14	11/07/15 12:38	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2060**	ug/L	20.0	20		11/06/15 16:44	71-43-2	
Ethylbenzene	**724**	ug/L	50.0	20		11/06/15 16:44	100-41-4	
Gasoline Range Organics	**14200**	ug/L	2000	20		11/06/15 16:44		
Toluene	**1880**	ug/L	50.0	20		11/06/15 16:44	108-88-3	
Xylene (Total)	**3120**	ug/L	60.0	20		11/06/15 16:44	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	114	%.	80-150	20		11/06/15 16:44	98-08-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: MW-9 **Lab ID: 10328800005** Collected: 11/03/15 12:50 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**10.6**	mg/L	0.53	5	11/05/15 12:14	11/07/15 11:51		T7
Surrogates								
n-Triacontane (S)	77	%.	50-150	5	11/05/15 12:14	11/07/15 11:51	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**5470**	ug/L	50.0	50		11/06/15 17:32	71-43-2	
Ethylbenzene	**1620**	ug/L	125	50		11/06/15 17:32	100-41-4	
Gasoline Range Organics	**33700**	ug/L	5000	50		11/06/15 17:32		
Toluene	**5160**	ug/L	125	50		11/06/15 17:32	108-88-3	
Xylene (Total)	**8010**	ug/L	150	50		11/06/15 17:32	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	100	%.	80-150	50		11/06/15 17:32	98-08-8	

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: MW-8 **Lab ID: 10328800006** Collected: 11/03/15 13:25 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**12.4**	mg/L	0.52	5	11/05/15 12:14	11/07/15 11:59		T7
Surrogates								
n-Triacontane (S)	84	%.	50-150	5	11/05/15 12:14	11/07/15 11:59	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**1020**	ug/L	20.0	20		11/06/15 18:19	71-43-2	
Ethylbenzene	**335**	ug/L	50.0	20		11/06/15 18:19	100-41-4	
Gasoline Range Organics	**15100**	ug/L	2000	20		11/06/15 18:19		
Toluene	**1680**	ug/L	50.0	20		11/06/15 18:19	108-88-3	
Xylene (Total)	**1900**	ug/L	60.0	20		11/06/15 18:19	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	95	%.	80-150	20		11/06/15 18:19	98-08-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: MW-7 **Lab ID: 10328800007** Collected: 11/03/15 14:05 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**19.2**	mg/L	1.1	10	11/05/15 12:14	11/07/15 12:07		T7
Surrogates								
n-Triacontane (S)	69	%.	50-150	10	11/05/15 12:14	11/07/15 12:07	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**3140**	ug/L	50.0	50		11/06/15 19:06	71-43-2	
Ethylbenzene	**1530**	ug/L	125	50		11/06/15 19:06	100-41-4	
Gasoline Range Organics	**35900**	ug/L	5000	50		11/06/15 19:06		
Toluene	**7140**	ug/L	125	50		11/06/15 19:06	108-88-3	
Xylene (Total)	**8450**	ug/L	150	50		11/06/15 19:06	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	106	%.	80-150	50		11/06/15 19:06	98-08-8	

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: MW-3 **Lab ID: 10328800008** Collected: 11/03/15 14:40 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**7.3**	mg/L	0.52	5	11/05/15 12:14	11/07/15 11:44		T7
Surrogates								
n-Triacontane (S)	62	%.	50-150	5	11/05/15 12:14	11/07/15 11:44	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**1560**	ug/L	20.0	20		11/06/15 19:53	71-43-2	
Ethylbenzene	ND	ug/L	50.0	20		11/06/15 19:53	100-41-4	
Gasoline Range Organics	**16300**	ug/L	2000	20		11/06/15 19:53		
Toluene	**1370**	ug/L	50.0	20		11/06/15 19:53	108-88-3	
Xylene (Total)	**4400**	ug/L	60.0	20		11/06/15 19:53	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	106	%.	80-150	20		11/06/15 19:53	98-08-8	

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: DUPLICATE **Lab ID: 10328800009** Collected: 11/03/15 00:00 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**4.6**	mg/L	0.11	1	11/05/15 12:14	11/07/15 12:15		T7
Surrogates								
n-Triacontane (S)	78	%.	50-150	1	11/05/15 12:14	11/07/15 12:15	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2150**	ug/L	20.0	20		11/06/15 20:40	71-43-2	
Ethylbenzene	**865**	ug/L	50.0	20		11/06/15 20:40	100-41-4	
Gasoline Range Organics	**16200**	ug/L	2000	20		11/06/15 20:40		
Toluene	**2000**	ug/L	50.0	20		11/06/15 20:40	108-88-3	
Xylene (Total)	**3820**	ug/L	60.0	20		11/06/15 20:40	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	100	%.	80-150	20		11/06/15 20:40	98-08-8	

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ANALYTICAL RESULTS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Sample: TRIP BLANK **Lab ID: 10328800010** Collected: 11/03/15 00:00 Received: 11/04/15 12:04 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		11/06/15 02:54	71-43-2	
Ethylbenzene	ND	ug/L	2.5	1		11/06/15 02:54	100-41-4	
Gasoline Range Organics	ND	ug/L	100	1		11/06/15 02:54		
Toluene	ND	ug/L	2.5	1		11/06/15 02:54	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		11/06/15 02:54	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	103	%.	80-150	1		11/06/15 02:54	98-08-8	

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QUALITY CONTROL DATA

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

QC Batch: GCV/14602 Analysis Method: WI MOD GRO
QC Batch Method: WI MOD GRO Analysis Description: WIGRO GCV Water
Associated Lab Samples: 10328800001, 10328800002, 10328800010

METHOD BLANK: 2127968 Matrix: Water
Associated Lab Samples: 10328800001, 10328800002, 10328800010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	11/05/15 17:29	
Ethylbenzene	ug/L	ND	2.5	11/05/15 17:29	
Gasoline Range Organics	ug/L	ND	100	11/05/15 17:29	
Toluene	ug/L	ND	2.5	11/05/15 17:29	
Xylene (Total)	ug/L	ND	3.0	11/05/15 17:29	
a,a,a-Trifluorotoluene (S)	%.	101	80-150	11/05/15 17:29	

LABORATORY CONTROL SAMPLE & LCSD: 2127969 2127970

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Benzene	ug/L	100	91.6	91.5	92	91	80-120	0	20	
Ethylbenzene	ug/L	100	91.0	93.2	91	93	80-120	2	20	
Gasoline Range Organics	ug/L	1000	969	930	97	93	80-120	4	20	
Toluene	ug/L	100	90.6	95.5	91	95	80-120	5	20	
Xylene (Total)	ug/L	300	258	271	86	90	80-120	5	20	
a,a,a-Trifluorotoluene (S)	%.				107	103	80-150			

MATRIX SPIKE SAMPLE: 2128195

Parameter	Units	10328519001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Benzene	ug/L	3.2	100	110	107	80-120	
Ethylbenzene	ug/L	ND	100	107	107	80-120	
Gasoline Range Organics	ug/L	ND	1000	1100	106	80-120	
Toluene	ug/L	ND	100	110	110	80-120	
Xylene (Total)	ug/L	ND	300	306	102	80-120	
a,a,a-Trifluorotoluene (S)	%.				112	80-150	

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QUALITY CONTROL DATA

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

QC Batch: GCV/14605 Analysis Method: WI MOD GRO
QC Batch Method: WI MOD GRO Analysis Description: WIGRO GCV Water
Associated Lab Samples: 10328800003, 10328800004, 10328800005, 10328800006, 10328800007, 10328800008, 10328800009

METHOD BLANK: 2128820 Matrix: Water
Associated Lab Samples: 10328800003, 10328800004, 10328800005, 10328800006, 10328800007, 10328800008, 10328800009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	11/06/15 14:23	
Ethylbenzene	ug/L	ND	2.5	11/06/15 14:23	
Gasoline Range Organics	ug/L	ND	100	11/06/15 14:23	
Toluene	ug/L	ND	2.5	11/06/15 14:23	
Xylene (Total)	ug/L	ND	3.0	11/06/15 14:23	
a,a,a-Trifluorotoluene (S)	%.	108	80-150	11/06/15 14:23	

LABORATORY CONTROL SAMPLE & LCSD: 2128821 2128822

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Benzene	ug/L	100	97.2	91.5	97	91	80-120	6	20	
Ethylbenzene	ug/L	100	98.5	95.4	98	95	80-120	3	20	
Gasoline Range Organics	ug/L	1000	938	908	94	91	80-120	3	20	
Toluene	ug/L	100	97.2	93.8	97	94	80-120	4	20	
Xylene (Total)	ug/L	300	278	268	93	89	80-120	3	20	
a,a,a-Trifluorotoluene (S)	%.				99	100	80-150			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2130411 2130412

Parameter	Units	10329302001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Qual
Benzene	ug/L	78.4	100	100	182	176	104	98	80-120	3	
Ethylbenzene	ug/L	ND	100	100	108	103	106	101	80-120	4	
Gasoline Range Organics	ug/L	279	1000	1000	1170	1180	89	90	80-120	1	
Toluene	ug/L	15.9	100	100	111	106	95	90	80-120	5	
Xylene (Total)	ug/L	39.6	300	300	321	303	94	88	80-120	6	
a,a,a-Trifluorotoluene (S)	%.						98	103	80-150		

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QUALITY CONTROL DATA

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

QC Batch: OEXT/31544 Analysis Method: WI MOD DRO
QC Batch Method: WI MOD DRO Analysis Description: WIDRO GCS
Associated Lab Samples: 10328800001, 10328800002, 10328800003, 10328800004, 10328800005, 10328800006, 10328800007, 10328800008, 10328800009

METHOD BLANK: 2127612 Matrix: Water
Associated Lab Samples: 10328800001, 10328800002, 10328800003, 10328800004, 10328800005, 10328800006, 10328800007, 10328800008, 10328800009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
WDRO C10-C28	mg/L	ND	0.10	11/07/15 11:28	
n-Triacontane (S)	%.	73	50-150	11/07/15 11:28	

LABORATORY CONTROL SAMPLE & LCSD: 2127613 2127614

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
WDRO C10-C28	mg/L	2	1.8	1.8	88	92	75-115	4	20	
n-Triacontane (S)	%.				78	76	50-150			

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QUALIFIERS

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

1M	Results for sample10328800001 appear to indicate that the vials were non-homogenous. The highest value was reported to present the highest risk data.
D6	The relative percent difference (RPD) between the sample and sample duplicate exceeded laboratory control limits.
T7	Low boiling point hydrocarbons are present in the sample.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 32280007 Cambridge GW Monitori
Pace Project No.: 10328800

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10328800001	**MW-1**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800002	**MW-11**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800003	**MW-10**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800004	**MW-6**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800005	**MW-9**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800006	**MW-8**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800007	**MW-7**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800008	**MW-3**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800009	**DUPLICATE**	WI MOD DRO	OEXT/31544	WI MOD DRO	GCSV/17207
10328800001	**MW-1**	WI MOD GRO	GCV/14602		
10328800002	**MW-11**	WI MOD GRO	GCV/14602		
10328800003	**MW-10**	WI MOD GRO	GCV/14605		
10328800004	**MW-6**	WI MOD GRO	GCV/14605		
10328800005	**MW-9**	WI MOD GRO	GCV/14605		
10328800006	**MW-8**	WI MOD GRO	GCV/14605		
10328800007	**MW-7**	WI MOD GRO	GCV/14605		
10328800008	**MW-3**	WI MOD GRO	GCV/14605		
10328800009	**DUPLICATE**	WI MOD GRO	GCV/14605		
10328800010	**TRIP BLANK**	WI MOD GRO	GCV/14602		

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

10328800

Page: 1 of 1

1986852

Section A Required Client Information:

Company: WENCK Associates
Address: 1800 Pioneer Creek Center
Maple Plain MN
Email To: AZobel@wenck.com
Phone: 763-479-5145
Requested Due Date/TAT: Normal

Section B Required Project Information:

Report To: Adam Zobel AZobel@wenck.com
Copy To: Cory Anderson
canderson@wenck.com
Purchase Order No.:
Project Name: Cambridge GW monitoring
Project Number: 3228 0007

Section C Invoice Information:

Attention: Melissa Winterhalter
Company Name: WENCK Associates
Address: 1800 Pioneer Creek Maple Plain
Pace Quote Reference: MW 55359
Pace Project Manager: Kabor Xiong
Pace Profile #:

REGULATORY AGENCY
☐ NPDES ☑ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: MN

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 #	SAMPLE ID	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: DRO	GRO/BTEX	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MW-1	WT	G	~~11/3/15~~ 10		11/3/15	10:20		5				5						2	3		
2	MW-11						10:45						5						2	3		
3	MW-10						11:05						5						2	3		
4	MW-6						12:03						5						2	3		
5	MW-9						12:50						5						2	3		
6	MW-8						13:25						5						2	3		
7	MW-7						14:05						5						2	3		
8	MW-3						14:40						5						2	3		
9	Duplicate												5						2	3		
10	Trip Blank												2							2		
11																						
12																						

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Cory Anderson (Wenck)	11/4/15								
				Joe Scott/Pace	11.4.15	1115				
	Joe Scott/Pace	11.4.15	1209	Doug Fish Pace	11/4/15	1209	3.5 / 3.1	11.4.15	N	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE
PRINT Name of SAMPLER: Cory Anderson
SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 11/4/15

Temp in °C: 3.2

*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.

F-ALL-Q-020rev.07, 15-May-2007

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 23Feb2015 Page 1 of 1
	Document No.: **F-MN-L-213-rev.13**	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wenck Associates

Project #: WO# : 10328800

10328800

Courier: ☐Fed Ex ☐UPS ☐USPS ☐Client ☐Commercial ☒Pace ☐SpeeDee ☐Other:_____

Tracking Number: _____

Custody Seal on Cooler/Box Present? ☐Yes ☒No **Seals Intact?** ☐Yes ☒No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☐Bubble Wrap ☒Bubble Bags ☐None ☐Other:_____ **Temp Blank?** ☒Yes ☐No

Thermometer Used: ☐B88A9130516413 ☒B88A0143310098 ☐B88A912167504 **Type of Ice:** ☒Wet ☐Blue ☐None ☐Samples on ice, cooling process has begun

Cooler Temp Read (°C): 3.1 3.2 **Cooler Temp Corrected (°C):** 3.5 3.1 3.2

Temp should be above freezing to 6°C **Correction Factor:** 0.0 **Biological Tissue Frozen?** ☐Yes ☐No ☒N/A

Date and Initials of Person Examining Contents: BT 11/4/15

USDA Regulated Soil (☒N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, AZ, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or WA (check maps)? ☐Yes ☐No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐Yes ☐No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present?	☒Yes	☐No	☐N/A	1.
Chain of Custody Filled Out?	☒Yes	☐No	☐N/A	2.
Chain of Custody Relinquished?	☒Yes	☐No	☐N/A	3.
Sampler Name and/or Signature on COC?	☒Yes	☐No	☐N/A	4.
Samples Arrived within Hold Time?	☒Yes	☐No	☐N/A	5.
Short Hold Time Analysis (<72 hr)?	☐Yes	☒No	☐N/A	6.
Rush Turn Around Time Requested?	☐Yes	☒No	☐N/A	7.
Sufficient Volume?	☒Yes	☐No	☐N/A	8.
Correct Containers Used?	☒Yes	☐No	☐N/A	9.
-Pace Containers Used?	☒Yes	☐No	☐N/A	
Containers Intact?	☒Yes	☐No	☐N/A	10.
Filtered Volume Received for Dissolved Tests?	☐Yes	☐No	☒N/A	11. Note if sediment is visible in the dissolved container
Sample Labels Match COC? -Includes Date/Time/ID/Analysis Matrix: wet	☒Yes	☐No	☐N/A	12.
All containers needing acid/base preservation have been checked?	☐Yes	☐No	☒N/A	13. ☐HNO_3 ☐H_2SO_4 ☐NaOH ☐HCl Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, HCl<2; NaOH >9 Sulfide, NaOH>12 Cyanide)	☐Yes	☐No	☒N/A	
Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC	☒Yes	☐No	☐N/A	Initial when completed: Lot # of added preservative:
Headspace in VOA Vials (>6mm)?	☐Yes	☒No	☐N/A	14.
Trip Blank Present?	☒Yes	☐No	☐N/A	15.
Trip Blank Custody Seals Present?	☒Yes	☐No	☐N/A	
Pace Trip Blank Lot # (if purchased): 100515-01				

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐Yes ☐No

Person Contacted: _____ Date/Time: _____

Comments/Resolution: _____

Project Manager Review: Kristine Kump **Date:** 11/5/15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

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(612)607-1700

February 05, 2016

Adam P. Zobel
Wenck Associates, Inc
1800 Pioneer Creek Center
P.O. BOX 249
Maple Plain, MN 55359

RE: Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Dear Adam Zobel:
Enclosed are the analytical results for sample(s) received by the laboratory on February 03, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Carrie Jensen
carrie.jensen@pacelabs.com
Project Manager

Enclosures

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CERTIFICATIONS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
525 N 8th Street, Salina, KS 67401
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: MW-1 **Lab ID: 10337538001** Collected: 02/02/16 10:12 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**1.0**	mg/L	0.11	1	02/03/16 15:39	02/04/16 16:41		T7
Surrogates								
n-Triacontane (S)	86	%.	50-150	1	02/03/16 15:39	02/04/16 16:41	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	2.0	2		02/04/16 14:58	71-43-2	
Ethylbenzene	**15.6**	ug/L	2.0	2		02/04/16 14:58	100-41-4	
Gasoline Range Organics	**1960**	ug/L	200	2		02/04/16 14:58		
Toluene	ND	ug/L	2.0	2		02/04/16 14:58	108-88-3	
Xylene (Total)	**666**	ug/L	6.0	2		02/04/16 14:58	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	98	%.	80-150	2		02/04/16 14:58	98-08-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: MW-10 **Lab ID: 10337538002** Collected: 02/02/16 11:02 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**4.4**	mg/L	0.11	1	02/03/16 15:39	02/04/16 16:48		T7
Surrogates								
n-Triacontane (S)	83	%.	50-150	1	02/03/16 15:39	02/04/16 16:48	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**277**	ug/L	10.0	10		02/04/16 14:35	71-43-2	
Ethylbenzene	**363**	ug/L	10.0	10		02/04/16 14:35	100-41-4	
Gasoline Range Organics	**8060**	ug/L	1000	10		02/04/16 14:35		
Toluene	**291**	ug/L	10.0	10		02/04/16 14:35	108-88-3	
Xylene (Total)	**1270**	ug/L	30.0	10		02/04/16 14:35	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	115	%.	80-150	10		02/04/16 14:35	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: MW-6 **Lab ID: 10337538003** Collected: 02/02/16 11:45 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**5.2**	mg/L	0.11	1	02/03/16 15:39	02/04/16 16:34		T6,T7
Surrogates								
n-Triacontane (S)	82	%.	50-150	1	02/03/16 15:39	02/04/16 16:34	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**1910**	ug/L	20.0	20		02/04/16 13:24	71-43-2	
Ethylbenzene	**874**	ug/L	20.0	20		02/04/16 13:24	100-41-4	
Gasoline Range Organics	**18600**	ug/L	2000	20		02/04/16 13:24		
Toluene	**1930**	ug/L	20.0	20		02/04/16 13:24	108-88-3	
Xylene (Total)	**3710**	ug/L	60.0	20		02/04/16 13:24	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	105	%.	80-150	20		02/04/16 13:24	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: MW-9 **Lab ID: 10337538004** Collected: 02/02/16 13:13 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**10.3**	mg/L	0.53	5	02/03/16 15:39	02/05/16 09:51		T7
Surrogates								
n-Triacontane (S)	88	%.	50-150	5	02/03/16 15:39	02/05/16 09:51	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**4100**	ug/L	50.0	50		02/04/16 12:37	71-43-2	
Ethylbenzene	**1070**	ug/L	50.0	50		02/04/16 12:37	100-41-4	
Gasoline Range Organics	**27700**	ug/L	5000	50		02/04/16 12:37		
Toluene	**3760**	ug/L	50.0	50		02/04/16 12:37	108-88-3	
Xylene (Total)	**5720**	ug/L	150	50		02/04/16 12:37	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	100	%.	80-150	50		02/04/16 12:37	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: MW-8 **Lab ID: 10337538005** Collected: 02/02/16 13:48 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**8.5**	mg/L	0.52	5	02/03/16 15:39	02/05/16 09:57		T7
Surrogates								
n-Triacontane (S)	70	%.	50-150	5	02/03/16 15:39	02/05/16 09:57	638-68-6	
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**1360**	ug/L	20.0	20		02/04/16 13:48	71-43-2	
Ethylbenzene	**526**	ug/L	20.0	20		02/04/16 13:48	100-41-4	
Gasoline Range Organics	**21400**	ug/L	2000	20		02/04/16 13:48		
Toluene	**2100**	ug/L	20.0	20		02/04/16 13:48	108-88-3	
Xylene (Total)	**2880**	ug/L	60.0	20		02/04/16 13:48	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	101	%.	80-150	20		02/04/16 13:48	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: MW-7 **Lab ID: 10337538006** Collected: 02/02/16 14:22 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**19.4**	mg/L	1.1	10	02/03/16 15:39	02/05/16 10:04		T7
Surrogates								
n-Triacontane (S)	0	%.	50-150	10	02/03/16 15:39	02/05/16 10:04	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2850**	ug/L	50.0	50		02/04/16 13:01	71-43-2	
Ethylbenzene	**1450**	ug/L	50.0	50		02/04/16 13:01	100-41-4	
Gasoline Range Organics	**37900**	ug/L	5000	50		02/04/16 13:01		
Toluene	**5410**	ug/L	50.0	50		02/04/16 13:01	108-88-3	
Xylene (Total)	**8550**	ug/L	150	50		02/04/16 13:01	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	97	%.	80-150	50		02/04/16 13:01	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: MW-3 **Lab ID: 10337538007** Collected: 02/02/16 15:15 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**15.8**	mg/L	1.0	10	02/03/16 15:39	02/05/16 10:11		T7
Surrogates								
n-Triacontane (S)	0	%.	50-150	10	02/03/16 15:39	02/05/16 10:11	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**2280**	ug/L	20.0	20		02/04/16 14:11	71-43-2	
Ethylbenzene	**163**	ug/L	20.0	20		02/04/16 14:11	100-41-4	
Gasoline Range Organics	**19700**	ug/L	2000	20		02/04/16 14:11		
Toluene	**1430**	ug/L	20.0	20		02/04/16 14:11	108-88-3	
Xylene (Total)	**4490**	ug/L	60.0	20		02/04/16 14:11	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	105	%.	80-150	20		02/04/16 14:11	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: DUP-1 **Lab ID: 10337538008** Collected: 02/02/16 00:00 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIDRO GCS	Analytical Method: WI MOD DRO Preparation Method: WI MOD DRO							
WDRO C10-C28	**10.3**	mg/L	1.0	10	02/03/16 15:39	02/05/16 10:18		T7
Surrogates								
n-Triacontane (S)	0	%.	50-150	10	02/03/16 15:39	02/05/16 10:18	638-68-6	S4
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	**1370**	ug/L	20.0	20		02/04/16 15:22	71-43-2	
Ethylbenzene	**476**	ug/L	20.0	20		02/04/16 15:22	100-41-4	
Gasoline Range Organics	**15900**	ug/L	2000	20		02/04/16 15:22		
Toluene	**2020**	ug/L	20.0	20		02/04/16 15:22	108-88-3	
Xylene (Total)	**2550**	ug/L	60.0	20		02/04/16 15:22	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	105	%.	80-150	20		02/04/16 15:22	98-08-8	

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ANALYTICAL RESULTS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Sample: TRIP BLANK **Lab ID: 10337538009** Collected: 02/02/16 00:00 Received: 02/03/16 12:29 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
WIGRO GCV	Analytical Method: WI MOD GRO							
Benzene	ND	ug/L	1.0	1		02/04/16 20:51	71-43-2	
Ethylbenzene	ND	ug/L	1.0	1		02/04/16 20:51	100-41-4	
Gasoline Range Organics	ND	ug/L	100	1		02/04/16 20:51		
Toluene	ND	ug/L	1.0	1		02/04/16 20:51	108-88-3	
Xylene (Total)	ND	ug/L	3.0	1		02/04/16 20:51	1330-20-7	
Surrogates								
a,a,a-Trifluorotoluene (S)	98	%.	80-150	1		02/04/16 20:51	98-08-8	

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QUALITY CONTROL DATA

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

QC Batch: GCV/14921 Analysis Method: WI MOD GRO
QC Batch Method: WI MOD GRO Analysis Description: WIGRO GCV Water
Associated Lab Samples: 10337538001, 10337538002, 10337538003, 10337538004, 10337538005, 10337538006, 10337538007, 10337538008, 10337538009

METHOD BLANK: 2185787 Matrix: Water
Associated Lab Samples: 10337538001, 10337538002, 10337538003, 10337538004, 10337538005, 10337538006, 10337538007, 10337538008, 10337538009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Benzene	ug/L	ND	1.0	02/04/16 10:39	
Ethylbenzene	ug/L	ND	1.0	02/04/16 10:39	
Gasoline Range Organics	ug/L	ND	100	02/04/16 10:39	
Toluene	ug/L	ND	1.0	02/04/16 10:39	
Xylene (Total)	ug/L	ND	3.0	02/04/16 10:39	
a,a,a-Trifluorotoluene (S)	%.	96	80-150	02/04/16 10:39	

LABORATORY CONTROL SAMPLE & LCSD: 2185788 2185789

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Benzene	ug/L	100	91.5	99.3	91	99	80-120	8	20	
Ethylbenzene	ug/L	100	86.5	95.8	86	96	80-120	10	20	
Gasoline Range Organics	ug/L	1000	959	962	96	96	80-120	0	20	
Toluene	ug/L	100	94.2	102	94	102	80-120	8	20	
Xylene (Total)	ug/L	300	275	296	92	99	80-120	7	20	
a,a,a-Trifluorotoluene (S)	%.				99	100	80-150			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2185797 2185798

Parameter	Units	10337533001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Qual
Benzene	ug/L	1.8	100	100	98.7	101	97	99	80-120	3	
Ethylbenzene	ug/L	ND	100	100	93.0	95.4	93	95	80-120	3	
Gasoline Range Organics	ug/L	ND	1000	1000	1020	1050	102	105	80-120	2	
Toluene	ug/L	ND	100	100	99.6	102	99	102	80-120	2	
Xylene (Total)	ug/L	ND	300	300	288	296	96	99	80-120	3	
a,a,a-Trifluorotoluene (S)	%.						100	99	80-150		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

QC Batch: OEXT/32452 Analysis Method: WI MOD DRO
QC Batch Method: WI MOD DRO Analysis Description: WIDRO GCS
Associated Lab Samples: 10337538001, 10337538002, 10337538003, 10337538004, 10337538005, 10337538006, 10337538007, 10337538008

METHOD BLANK: 2185187 Matrix: Water
Associated Lab Samples: 10337538001, 10337538002, 10337538003, 10337538004, 10337538005, 10337538006, 10337538007, 10337538008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
WDRO C10-C28	mg/L	ND	0.10	02/04/16 15:45	
n-Triacontane (S)	%.	73	50-150	02/04/16 15:45	

LABORATORY CONTROL SAMPLE & LCSD: 2185188 2185189

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
WDRO C10-C28	mg/L	2	1.6	1.7	82	83	75-115	2	20	
n-Triacontane (S)	%.				84	83	50-150			

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QUALIFIERS

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

S4	Surrogate recovery not evaluated against control limits due to sample dilution.
T6	High boiling point hydrocarbons are present in the sample.
T7	Low boiling point hydrocarbons are present in the sample.

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Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 3228-01 Cambridge GW Monitorin
Pace Project No.: 10337538

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10337538001	**MW-1**	WI MOD DRO	OEXT/32452	WI MOD DRO	GCSV/17848
10337538002	**MW-10**	WI MOD DRO	OEXT/32452	WI MOD DRO	GCSV/17848
10337538003	**MW-6**	WI MOD DRO	OEXT/32452	WI MOD DRO	GCSV/17848
10337538004	**MW-9**	WI MOD DRO	OEXT/32452	WI MOD DRO	GCSV/17848
10337538005	**MW-8**	WI MOD DRO	OEXT/32452	WI MOD DRO	GCSV/17848
10337538006	**MW-7**	WI MOD DRO	OEXT/32452	WI MOD DRO	GCSV/17848
10337538007	**MW-3**	WI MOD DRO	OEXT/32452	WI MOD DRO	GCSV/17848
10337538008	**DUP-1**	WI MOD DRO	OEXT/32452	WI MOD DRO	GCSV/17848
10337538001	**MW-1**	WI MOD GRO	GCV/14921		
10337538002	**MW-10**	WI MOD GRO	GCV/14921		
10337538003	**MW-6**	WI MOD GRO	GCV/14921		
10337538004	**MW-9**	WI MOD GRO	GCV/14921		
10337538005	**MW-8**	WI MOD GRO	GCV/14921		
10337538006	**MW-7**	WI MOD GRO	GCV/14921		
10337538007	**MW-3**	WI MOD GRO	GCV/14921		
10337538008	**DUP-1**	WI MOD GRO	GCV/14921		
10337538009	**TRIP BLANK**	WI MOD GRO	GCV/14921		

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

2316105

1033705 39

Page: 1 of 1

2022340

Section A Required Client Information:

Company: Wenck Assoc
Address: 1800 Pioneer Creek Center
Maple Plain, MN
Email To: canderson@wenck.com
Phone: 763-479-5189 Fax:
Requested Due Date/TAT: Normal

Section B Required Project Information:

Report To: Cory Anderson canderson@wenck
Copy To: Adam Zobel azobel@wenck.com
Purchase Order No.:
Project Name: Cambridge GW Monitoring
Project Number: 3228-01

Section C Invoice Information:

Attention: Melissa Winterhalter
Company Name: Wenck Associates
Address: 1800 Pioneer Creek Center
Pace Quote Reference: Maple Plain, MN 55359
Pace Project Manager: Kasha Xiong
Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☒ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: MN

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 #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	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	Analysis Test Y/N: DRO	GRO/BTEX	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MW-1					2/2/16	10:32		5				5					Y	Y		001
2	MW-10						11:02		5				5					Y	Y		002
3	MW-6						12:45		5				5					Y	Y		003
4	MW-9						13:13		5				5					Y	Y		004 2316105
5	MW-8						13:48		5				5					Y	Y		005 P
6	MW-7						14:22		5				5					Y	Y		006
7	MW-3						15:15		5				5					Y	Y		007
8	DUP-1						—		5				5					Y	Y		008
9	Trip Blank						—		2									X			009
10	Trip Blank						—		2									X			009
11																					
12																					

End COC 2/2/16

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
Two Trip Blanks	Cory Anderson (Wenck)	2/3/16	11:40	Joe Smith / Pace	2.3.16	1140				
Three coolers			1229	Jake Pace	2-3-16	1229	2.1	Y	Y	Y
		2.3.16	1229				2.3			
							1.6			

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Cory Anderson

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY): 2/3/16

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.

F-ALL-O-020rev.07, 15-May-2007

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 05Jan2016 Page 1 of 1
	Document No.: **F-MN-L-213-rev.1S**	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Wench

Project #: WO# : 10337538

10337538

Courier: ☐Fed Ex ☐UPS ☐USPS ☐Client ☐Commercial ☑Pace ☐SpeeDee ☐Other:_____

Tracking Number: _____

Custody Seal on Cooler/Box Present? ☑Yes ☐No **Seals Intact?** ☑Yes ☐No **Optional:** Proj. Due Date: Proj. Name:

Packing Material: ☐Bubble Wrap ☑Bubble Bags ☐None ☐Other:_____ **Temp Blank?** ☑Yes ☐No

Thermometer Used: ☐151401163 ☑151401164 ☐B88A912167504 ☐B88A0143310098 **Type of Ice:** ☑Wet ☐Blue ☐None ☐Samples on ice, cooling process has begun

Cooler Temp Read (°C): 1.9 2.1 1.4 **Cooler Temp Corrected (°C):** 2.1, 2.3, 1.6 **Biological Tissue Frozen?** ☐Yes ☐No ☑N/A

Temp should be above freezing to 6°C **Correction Factor:** +0.2 **Date and Initials of Person Examining Contents:** 2-7-16 AG

USDA Regulated Soil (☐ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, AZ, CA, FL, GA, ID, LA. MS, NC, NM, NY, OK, OR, SC, TN, TX or WA (check maps)? ☐Yes ☐No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐Yes ☐No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present?	☑Yes	☐No	☐N/A	1.
Chain of Custody Filled Out?	☑Yes	☐No	☐N/A	2.
Chain of Custody Relinquished?	☑Yes	☐No	☐N/A	3.
Sampler Name and/or Signature on COC?	☑Yes	☐No	☐N/A	4.
Samples Arrived within Hold Time?	☑Yes	☐No	☐N/A	5.
Short Hold Time Analysis (<72 hr)?	☐Yes	☑No	☐N/A	6.
Rush Turn Around Time Requested?	☐Yes	☑No	☐N/A	7.
Sufficient Volume?	☑Yes	☐No	☐N/A	8.
Correct Containers Used?	☑Yes	☐No	☐N/A	9.
-Pace Containers Used?	☑Yes	☐No	☐N/A	
Containers Intact?	☑Yes	☐No	☐N/A	10.
Filtered Volume Received for Dissolved Tests?	☐Yes	☐No	☑N/A	11. Note if sediment is visible in the dissolved container
Sample Labels Match COC?	☑Yes	☐No	☐N/A	12.
-Includes Date/Time/ID/Analysis Matrix: WT				
All containers needing acid/base preservation have been checked?	☐Yes	☐No	☑N/A	13. ☐HNO_3 ☐H_2SO_4 ☐NaOH ☐HCl Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, HCl<2; NaOH >9 Sulfide, NaOH>12 Cyanide)	☐Yes	☐No	☑N/A	
Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/B015 (Water) DOC	☑Yes	☐No	☐N/A	Initial when completed:_____ Lot # of added preservative:_____
Headspace in VOA Vials (>6mm)?	☐Yes	☑No	☐N/A	14.
Trip Blank Present?	☑Yes	☐No	☐N/A	15.
Trip Blank Custody Seals Present?	☑Yes	☐No	☐N/A	
Pace Trip Blank Lot # (if purchased): 012516-01				

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐Yes ☐No

Person Contacted: _____ Date/Time: _____

Comments/Resolution: _____

Project Manager Review: _____ **Date:** 2/4/16

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Appendix E

Equipment / Instrument Manuals

FLUKE®

922

Airflow Meter

Users Manual

PN 2683880
November 2006 Rev.1, 12/07
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LIMITED WARRANTY AND LIMITATION OF LIABILITY

This Fluke product will be free from defects in material and workmanship for two years from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke's behalf. To obtain service during the warranty period, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that Service Center with a description of the problem.

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11/99

Table of Contents

Title **Page**

List of Tables

List of Figures

922

Introduction

The Fluke 922 Airflow Meter (“the Meter”) is a handheld instrument that measures differential pressure and calculates air velocity and air flow.

The Meter ships with the following items:

- Holster
- Carrying case
- Tubing and tubing strap
- Four AA Batteries (installed)
- Users Manual
- Wrist Strap

Safety Information and Symbols

A ⚠**Caution** identifies conditions and actions that may damage the Meter. A ⚠**Warning** identifies conditions and actions that pose hazard(s) to the user.

⚠⚠Warning

To avoid injury, or damage to the Meter, follow these safety guidelines:

- **Read the entire Users Manual before using the Meter.**
- **Use the Meter only as described in the Users Manual or the protection provided by the meter may be impaired.**
- **Inspect the Meter before use. Do not use it if it appears damaged.**
- **The Meter contains no user-serviceable parts. Do not open the Meter. For service, the Meter must be sent to Fluke. See "Contacting Fluke".**
- **Have the Meter serviced only by qualified service personnel.**
- **Adhere to local and national safety codes. Individual protective equipment must be used to prevent injury.**

⚠Caution

To avoid possible damage to the Meter, avoid using the Meter in an excessively dirty or dusty atmosphere. Excessive particle intake can damage the Meter.

International symbols used on the Meter and in the manual are explained in Table 1.

Table 1. International Symbols

Symbol	Description	Symbol	Description
	Risk of danger. Important information. Refer to manual.		Recycling information
	Battery		Conforms to Australian standards
	Conforms to EU directives		Do not dispose of this product as unsorted municipal waste. Contact Fluke or a qualified recycler for disposal.

Contacting Fluke

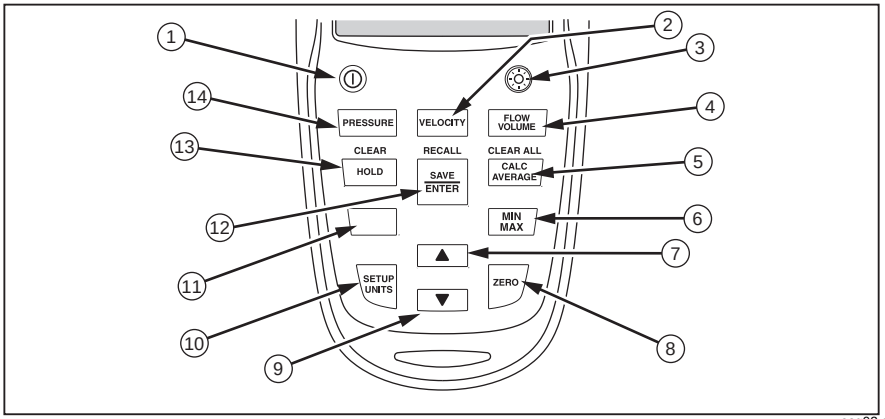
To contact Fluke, use one of the following telephone numbers:

USA: 1-888-99-FLUKE (1-888-993-5853)
Canada: 1-800-36-FLUKE (1-800-363-5853)
Europe: +31 402-675-200
Japan: +81-3-3434-0181
Singapore: +65-738-5655
Anywhere in the world: +1-425-446-5500

Or visit Fluke's Web site at: www.fluke.com.
Register the Meter at: http://register.fluke.com

Pushbutton Functions

Figure 1 and Table 2 explain the Meter's pushbuttons.



eog02.eps

Figure 1. 922 Airflow Meter

Table 2. Pushbuttons

Pushbutton	Function
①	Power button. Press to turn the Meter on or off. Hold for 5 seconds to display Meter's firmware version.
②	Activates velocity mode. See "Measuring Velocity".
③	Turns the backlight on and off.
④	Activates flow mode. See "Measuring Flow".
⑤	Calculates average of stored values.
⑥	Activates live Min Max Avg functions. See "Min Max Avg".
⑦	Used to increase manual inputs, scroll through memory, and to navigate the Setup menu.
⑧	Press and hold 2 seconds to zero out the display before taking readings.
⑨	Used to decrease manual inputs, scroll through memory, and to navigate the Setup menu.
⑩	Press to enter the Setup menu. See "The Setup Menu".
⑪	Used to access secondary features listed in yellow on the Meter.
⑫	Used to store data and accept changes to the setup menu and flow parameters.
⑬	Holds the present reading.
⑭	Activates pressure mode. See "Measuring Differential Pressure".

Display

Figure 2 and Table 3 describe the display.

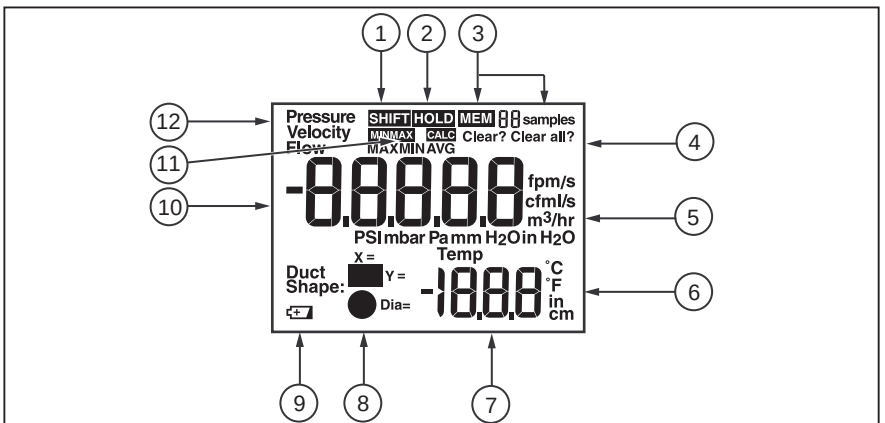


Figure 2. Display

Table 3. Display Description

①	Shift key is in use and secondary menu functionality is engaged
②	Hold is engaged
③	Annunciators showing that sample memory is being accessed and the number of samples
④	Indicates that a stored sample (or all samples) is about to be deleted from memory
⑤	Units of pressure, velocity, and flow
⑥	Units of length and temperature
⑦	Digits for temperature and setup parameters
⑧	Duct shape choices
⑨	Low battery indicator. Replace the battery as soon as the low battery indicator appears.
⑩	Digits for main measurements of pressure, velocity, and flow
⑪	Min Max and Hold indicators
⑫	Pressure, Velocity, or Flow modes are active

Using the Meter

Power

To turn Meter power on or off, press ⏻. Meter power is provided by four AA batteries. To replace the batteries, see “Maintenance”.

Measurement Units

The Meter supports both Metric and US measurement units. Select the desired measurement type using the Setup menu. See “The Setup Menu”.

Note

*If any measured value of any parameter is above the specified range, the Meter shows “***OL***”.*

Backlight

Press ☼ to turn on the backlight. The backlight automatically turns off after 2 minutes.

Automatic Power Off

To conserve battery power, the Meter changes to sleep mode after 20 minutes of inactivity. To turn the Meter back on, press ⏻. To disable automatic power off, turn the meter on while simultaneously holding ⏻ and ☼ until the display shows **APO OFF**. Repeat this procedure to re-enable this feature. The display shows **APO ON**.

Temperature

Ambient temperature is displayed on the Meter as a reference. The temperature can be displayed in either °C or °F. See "The Setup Menu".

Secondary Menu Modes

Use [ ] with other select pushbuttons to shift to secondary menu modes and functions:

- Press [ ] and then [HOLD] to access the Clear functions. See “Clearing Sample Data”.
- Press [ ] and then [SAVE ENTER] to access the Recall menu. See “Recall”.
- Press [ ] and then [CALC AVERAGE] to access the Clear All function. See “Clearing Sample Data”.

Zero

To zero differential pressure, velocity or flow, have both pressure ports open to ambient conditions, then, press and hold [ZERO] for 2 seconds. Upon zeroing, the meter beeps.

Min Max Avg

The Min Max mode stores live minimum (MIN) and maximum (MAX) input values. When the input drops below the stored minimum value or above the stored maximum value, the Meter beeps and stores the new value. Min Max mode also calculates an average (AVG) of all readings taken since the mode was activated. This mode can be used to capture

intermittent readings, record maximum and minimum readings while you are away or when you cannot watch the Meter.

To use Min Max mode, press MIN MAX. The maximum reading appears first. Each subsequent press of MIN MAX steps through the minimum, average, and live readings, and back to the maximum reading.

To exit Min Max mode, press MIN MAX for approximately two seconds. When in Min Max mode, the Auto-off feature is automatically disabled.

Hold

Pressing HOLD captures the current reading and holds it on the display. If HOLD is pressed while in Min Max mode, the reading is held on the display and Min Max mode continues to store minimum and maximum values.

Saving Samples

The Meter saves various samples in its three major modes. To save a sample, do the following:

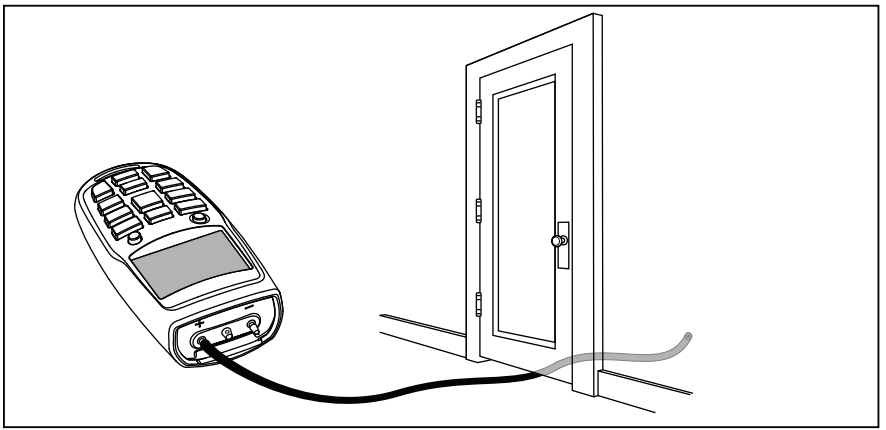
1. When taking a sample, press SAVE ENTER to store the sample. The Meter can save up to 99 samples in each of its three modes.
2. Once the samples are taken, press CALC AVERAGE to view the average of all the samples.

3. Press CALC AVERAGE, PRESSURE, VELOCITY or FLOW VOLUME to exit calculate mode. If the memory is full (99 samples have been stored), more samples cannot be stored. If the user attempts to store another sample, the Meter flashes "**Full**" and does not save new readings.

Measuring Differential Pressure

To measure differential pressure, do the following, see Figure 3:

1. Press PRESSURE to enter the pressure mode.
2. Connect a single hose to the "**Input (+)**" port, leaving the "**Ref (-)**" port unconnected.
3. With the tubing open to ambient conditions press and hold ZERO for 2 seconds.
4. Place the input hose in a different zone than the Meter.
5. The Meter displays the differential pressure of the input zone with respect to the reference zone. For instance, a positive reading means that the input zone is positively pressured with respect to the Meter location or its reference zone.



eog05.eps

Figure 3. Differential Pressure Measurement

Measuring Velocity

The Meter uses standard ambient conditions (temperature =21.1 °C/70 °F, barometric pressure = 14.7 psia / 1013 mbar), to approximate actual velocity and flow.

Velocity Measurement

To measure velocity, do the following:

1. Press VELOCITY to enter Velocity mode.
2. Connect the hoses to the pitot tube and to the Meter. The "**Input (+)**" pressure port on the Meter connects to the yellow hose from the total pressure connection of the pitot tube. The "**Ref (-)**" pressure port on the Meter connects to the black hose from the static pressure connection of the pitot tube. See Figure 4.

   Note

   If Measure Velocity measures negative on the display, check to make sure that the hoses are attached to the correct ports on the Meter and the pitot tube.
3. With the pitot tube open to ambient conditions press and hold ZERO for 2 seconds.

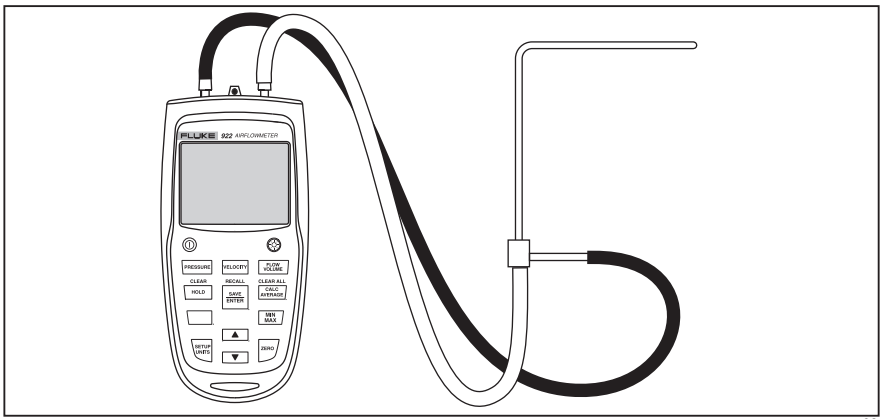


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Figure 4. Pitot Tube Connection

Measuring Flow

1. Press [FLOW VOLUME].
2. The Meter requests the duct shape and size. The Meter stores the last duct shape and size that is entered. If the duct is different than the stored version, press [▼] or [▲] to find the proper duct type for the measurement (rectangular or round).
3. Press [SAVE ENTER] to select the duct type.
4. If the duct is rectangular, use [▼] and [▲] to select the X dimension and press [SAVE ENTER] to store it. Use [▼] and [▲] to select the Y dimension. Hold [▼] or [▲] to increase the rate of change. Press [SAVE ENTER] to store it.
5. If the duct is round, use [▼] and [▲] to select the duct diameter and press [SAVE ENTER] to store it.
6. To measure flow, refer to Steps 2 - 3 in "Measuring Velocity".

Note

If Measure Velocity measures negative on the display, check to make sure that the hoses are attached to the correct ports on the Meter and the pitot tube.

Notes

HOLD, SAVE, CALCULATE, SHIFT, MIN MAX, ZERO, and SETUP UNITS can be used when measuring pressure, velocity and flow.

If PRESSURE *or* VELOCITY *is pressed before pressing* SAVE ENTER *for the final time, the Meter will escape the flow setup process and will not save any of the selections made or values entered.*

The Setup Menu

Use the Setup menu to change the following Meter parameters:

- Pressure units
- Velocity units
- Flow (Volume) units
- Temperature units
- Duct dimension units

To modify the Meter setup parameters:

1. From any screen, press SETUP UNITS to enter Setup menu editing mode.
2. Use ▼ and ▲ to change the measurement units. Hold down ▼ or ▲ to increase the rate of change.

3. Press SAVE ENTER to store the change. The Meter beeps to signal that the change has been stored. With each press of SAVE ENTER, the menu moves to the next parameter. To exit the Setup menu without changing subsequent parameters, press PRESSURE, VELOCITY, or FLOW VOLUME.

Clearing Sample Data

The Meter stores data that periodically will need to be cleared. Individual samples or the entire data memory can be cleared. When the memory is full (99 samples), it shows “Full” on the display when SAVE ENTER is pressed and the Meter emits short beeps and will not save any value unless some samples are cleared.

To clear individual sample data, do the following:

1. Press either PRESSURE, VELOCITY, or FLOW VOLUME to clear samples for that mode.
2. Press ⌐.
3. Press HOLD (CLEAR).
4. Use ▼ and ▲ to select the desired sample number. The last measurement saved appears first.
5. Press SAVE ENTER to clear the sample. Note that the number of samples displayed is reduced.

To clear all sample data, do the following:

1. Press ⌐.
2. Press CALC AVERAGE (CLEAR ALL).

3. Press SAVE ENTER to clear all samples. The Meter beeps and the display shows 0 samples.
4. To exit (CLEAR) or (CLEAR ALL) without deleting samples, press PRESSURE, VELOCITY, or FLOW VOLUME before pressing SAVE ENTER.

Recall

1. Press either PRESSURE, VELOCITY, or FLOW VOLUME to recall samples for that mode.
2. Press ⎕.
3. Press SAVE ENTER (RECALL) to recall samples. Use ▼ and ▲ to locate the desired sample. Hold ▲ or ▼ to increase the rate of change.
4. Press PRESSURE, VELOCITY, or FLOW VOLUME to exit the Recall menu.

Maintenance

This section provides basic maintenance information, including battery replacement instructions.

⚠Caution

Do not attempt to repair or service the Meter unless qualified to do so and have the relevant calibration, performance test, and service information.

Cleaning

Clean only with soap and water. Remove any residue afterwards.

Periodically wipe the case with a damp cloth and mild detergent.

Do not use abrasives or solvents.

Replacing the Batteries

When the low battery symbol appears () the meter will not save samples and “bAtt” appears on the display when SAVE ENTER is pressed.

The Meter uses four AA batteries (supplied). To replace the batteries, do the following (see Figure 5):

1. Turn off the Meter.
2. Remove the holster.
3. Place the Meter face down on a nonabrasive surface and loosen the battery door screw with a Phillips screwdriver.
4. Lift the battery access door away from the Meter.
5. Replace the batteries as shown in Figure 5. Observe the battery polarity shown in the battery compartment.
6. Secure the battery access door back in position with the screw.
7. Reinstall the Holster.

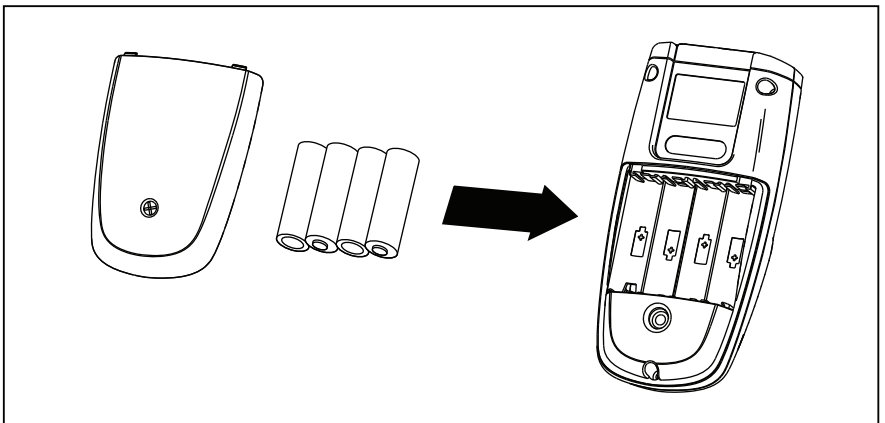

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Figure 5. Replacing the Batteries

Specifications

Parameter	Range	Accuracy	Resolution	Units Displayed
Air Pressure	± 4000 Pascal ± 16 in H_2O ± 400 mm H_2O ± 40 mbar ± 0.6 PSI	±1% + 1 Pascal ±1% + 0.01 in H_2O ±1% + 0.1 mm H_2O ±1% + 0.01 mbar ±1% + 0.0001 PSI	1 Pascal 0.001 in H_2O 0.1 mm H_2O 0.01 mbar 0.0001 PSI	Pa in H_2O mm H_2O mb PSI
Air Velocity	250-16,000 fpm 1-80 m/s	±2.5% of reading at 2000 fpm (10.00 m/s)	1 fpm 0.001 m/s	fpm m/s
Air Flow (Volume)	0-99,999 cfm 0-99,999 m^3/hr 0-99,999 l/s	accuracy is function of velocity and duct size	1 cfm 1 m^3/hr 1 l/s	cfm m^3/hr l/s
Temperature	0 to 50 °C 32 to 122 °F	±1 % + 2 °C ±1 % + 4 °F	0.1 °C 0.1 °F	°C °F
Use of Zero function is required to achieve these specifications.				

Environmental	
Operating Temperature	0 °C to +50 °C
Storage Temperature	-40 °C to +60 °C
Temperature Coefficient	0.025 X (specified accuracy) / °C (< 18 °C or > 28 °C)
Relative Humidity: Non condensing (< 10 °C) 90 % RH (10 °C to 30 °C) 75 % RH (30 °C to 40 °C) 45 % RH (40 °C to 50 °C)(Without Condensation)	
IP Rating	IP40
Operating Altitude	2000 m
Storage Altitude	12000 m
EMI, RFI, EMC	Meets requirements for EN61326-1
Vibration	MIL-PREF-28800F, Class 3
Maximum Pressure at each Port	10 PSI

Agency Approvals

CE Conforms to EU directives

N10140 Conforms to Australian standards

Replacement Parts

Replacement Part	Part Number
Battery 1.5 V Alkaline Size AA (4) NEDA 15A, IECLR6	650181
Holster	2729807
Wrist Strap	2729793
Hoses, 1 black and 1 yellow w/test lead strap	2766087
Battery Door	2729818
Battery Door Screw	2729829
Hard Carrying Case	2774694
Users Manual	2683880
Users Manual on CD	2766430

Accessories and Optional Items

Description	Item or Part Number
Toolpak Meter Hanging Kit Includes: Magnetic Strip, 2 Straps (9 inch and 12 inch), 2 Latch Tabs	TPak
Fluke 922 Kit Includes: Fluke 922 Airflow Meter, 12 inch pitot tube, TPak Magnetic Strip, TPak Strap, 9 inches, TPak Latch Tab, Four AA Batteries 1.5 V Alkaline, Users Manual, Large Carrying Case	Fluke 922-Kit

Series 477A Handheld Digital Manometer

Specifications - Installation and Operation Instructions

Series 477A Digital Manometers are versatile, hand-held, battery operated manometers available in several basic ranges from 0-20 in. w.c. up to 100 psi. All models measure either positive, negative or differential pressures with ±0.10% of full scale accuracy. You can select from up to seven common English and metric pressure units so conversions are not necessary. A memory function allows storage of up to 40 readings for later recall and a backlight provides auxiliary lighting for hard-to-see locations. Also standard are a hold feature plus both visual and audible overpressure alarms.

SPECIFICATIONS

Service: Air and compatible gases.
Wetted Parts: Consult factory.
Accuracy: ±0.10% of full scale from 60 to 78°F (15.6 to 25.6°C); ±1% of full scale from 32 to 60 and 78 to 104°F (0 to 15 .6 and 25.6 to 40°C).
Pressure Hysteresis: ±0.1% of full scale.
Pressure Limits: See chart.
Temperature Limits: 32 to 104°F (0 to 40°C).
Storage Temperature Limits: -4 to 176°F (-20 to 80°C).
Display: 4-digit LCD (.425˝ H x .234˝ W digits).
Resolution: See chart.
Power Requirements: 9 volt alkaline battery. Battery included but not connected.
Weight: 10.2 oz. (289 g).
Connections: Two barbed connections for use with 1/8˝ (3.18 mm) or 3/16˝ (4.76 mm) I.D. tubing for 477A-1, 477A-2, 477A-3, 477A-4 and 477A-5 only. Two compression fittings for use with 1/8˝ (3.18 mm) I.D. x 1/4˝ (6.35 mm) O.D. tubing for 477A-6 and 477A-7 only.

Model Number	English Range	Metric Range
477A-1	0-20.00 in. w.c.	0-4.982 kPa
477A-2	0-40.00 in. w.c.	0-9.96 kPa
477A-3	0-200.0 in. w.c.	0-49.82 kPa
477A-4	0-10.00 psi	0-68.95 kPa
477A-5	0-30.00 psi	0-206.9 kPa
477A-6	0-50.00 psi	0-344.8 kPa
477A-7	0-100.0 psi	0-689.5 kPa

Maximum Pressure	
477A-1	3 psi (0.21 bar)
477A-2	3 psi (0.21 bar)
477A-3	15 psi (1.03 bar)
477A-4	30 psi (2.07 bar)
477A-5	60 psi (4.13 bar)
477A-6	100 psi (6.89 bar)
477A-7	200 psi (13.78 bar)

Available Pressure Units:

477A-1 & 477A-2: psi, in. w.c., mm w.c., in. Hg, mm Hg, Pa, kPa, bar, mbar

477A-3 & 477A-4: psi, in. w.c., mm w.c., in. Hg, mm Hg, kPa, bar, mbar

477A-5, 477A-6 & 477A-7: psi, in. w.c., in. Hg, mm Hg, kPa, bar, mbar

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INSTRUCTIONS

Battery Installation

The unit is shipped with a separate 9 volt alkaline battery which must be installed before operation. Remove the two screws holding the bottom endcap in place and remove the endcap. Connect the battery to the enclosed battery clip observing correct polarity. Be careful not to trap wires between the battery, case or foam pads which retain the battery. This could make it difficult to install the battery or remove it later for replacement. Be sure the rubber gasket is properly seated in the gasket channel of the endcap and replace endcap. Note that the endcap will only fit one way because the holes are slightly off-center. Place the "Z" shaped wrist strap clip in one of the screw recesses and replace the screws. Do not overtighten the screws. Attach wrist strap to clip.

When battery replacement becomes necessary, use only a 9 volt alkaline type such as a Duracell® MN1604, Eveready® 522 or equivalent. Zinc-carbon types, often labeled Heavy-duty are not recommended because of the increased potential for leakage. Alkaline batteries are also a better value because they last up to three times longer in this device.

On-Off Operation

The on-off control is a toggle function. Press and release the ON/OFF key once to turn unit on; again to turn it off. If the manometer is left on with no activity for approximately 20 minutes, unit will turn itself off to conserve the battery.

Display Backlight

The Model 477A includes a display backlight to allow use in the dark or in poor lighting conditions. Manometer must be switched off before this feature can be activated. Next, press and hold the ON/OFF key down. After about 1 second the backlight will come on and remain lighted for approximately 2 minutes after which it will turn itself off to conserve battery life.

Zeroing Pressure Reading

Potential inaccuracy due to temperature effects can be minimized by re-zeroing immediately before use. To zero the display, vent both ports to atmosphere so no pressure is applied to either port. Press the ZERO/STORE key and - - - - will be momentarily displayed as zeroing occurs. Zeroing is not possible when the memory mode is in use. It must be done before selecting that function.

If the unit is accidently zeroed with pressure applied to one of the ports, the pressure reading might display incorrectly. To correct, vent the pressure ports to atmosphere and press the ZERO/STORE key to zero the unit.

Pressure Connections

To measure single positive pressure, connect tubing to port marked + and vent opposite port to atmosphere. To measure differential positive pressure, connect higher positive pressure to port marked + and lower positive pressure to port marked -. Manometer will indicate the difference between the two.

Selecting Pressure Units

Up to seven pressure units are available. The display will indicate the current selection. To change to different units, use the UNITS/LOC key. Each touch will cause an advance to the next choice. The selected units will remain in memory even when power is shut off. This way, your preference will always be displayed after the initial selection.

Display Hold

There may be situations where you want to temporarily retain a reading. The Model 477A includes a Display Hold feature which freezes the current reading and holds it in the display until cleared. To activate this operation, momentarily press the HOLD/MEMORY key when the pressure you want to save is displayed. A HOLD indicator will appear in the display to indicate that the reading shown is frozen. To return to normal operation, press the HOLD/MEMORY key again.The HOLD indicator will disappear and the current pressure will again be shown.

Memory Function

A memory function is included in the Model 477A that allows you to store up to 40 pressure readings for later review or recording. This feature is especially valuable for making a traverse of duct velocity pressures with a Pitot tube or for multipoint pressure measurements. The readings are stored in non-volatile memory so they will be retained even if the unit is shut off or the battery is removed.

Storing Pressure Readings

To store a reading, press and hold the HOLD/MEMORY until ST01 is displayed then release the key. Next, press ZERO/STORE key to save current reading to ST01 memory location. A beep will sound indicating that the reading has been saved. As each reading is saved, the memory location display will advance to the next number. To resume pressure measurement, press the HOLD/MEMORY key again. Note that in the memory mode, the display zero function is not available. To zero the display, you must first exit the memory mode and then press the ZERO/STORE key.

Viewing Stored Readings - Selecting a Location

To view the contents of memory, press and hold the HOLD/MEMORY until RD01 is displayed then release the key. Next, press UNITS/LOC to view other memory location. To resume pressure measurement, press the HOLD/MEMORY key again.

Clearing Memory

To clear the contents of memory, press and hold the HOLD/MEMORY until CLR is displayed then release the key. Next, press ZERO/STORE key to clear all previously stored readings. During this operation - - - - will be displayed. Once memory is cleared, the current pressure will be displayed.

Exiting Memory Mode

To exit the memory mode press the HOLD/MEMORY key again and the unit will return to normal operation.

Dampening Function

The dampening feature allows the user to enter a dampening number from 1 to 16 (default value = 2). Entering a larger number increases the amount of readings that are averaged for each display update.

In order to access the dampening feature, follow the instructions below:

1. Press and hold the HOLD/MEMORY button. The upper right portion of the LCD scrolls through a menu selection (HOLD, ST01, RD01, CLR, and DAMP). When "DAMP" is shown, release the HOLD/MEMORY button. This selects the dampening feature.

2. Once "DAMP" is selected, a number is shown in the upper right portion of the LCD, along with the current pressure reading. This number is the dampening number. Adjust the number up by pressing the ZERO/STORE button or down by pressing the UNITS/LOC button. The LCD update rate slows as the number increases from 1 to 16. Therefore, for best results, choose the smallest number that provides a stable pressure reading.

Once the pressure reading is stable, press and release the HOLD/MEMORY button to store the dampening value.

Overpressure Alarm

A visual indicator and audible alarm are provided to alert the operator that pressure has exceeded the operating range of the unit. Exceeding the range will not damage it or affect calibration as long as the maximum rated pressure is not exceeded. ***Do not exceed the maximum rated pressure of the manometer. Doing so will cause permanent damage to the sensor, may rupture the housing and/or cause injury.*** The maximum pressure is shown on the rear label and on page 1 of these instructions.

Low Battery Indicator

A weak battery can cause improper operation or inaccurate measurements. A low battery indicator is provided on the display to show when the battery needs replacement. Although the unit might appear to function and indicate properly, the accuracy of readings cannot be guaranteed when the LOW BAT indicator is illuminated. Replace the battery with a fresh one. Do not leave an exhausted battery in the unit due to potential leakage.

MAINTENANCE

The Series 477A handheld digital manometers are not field repairable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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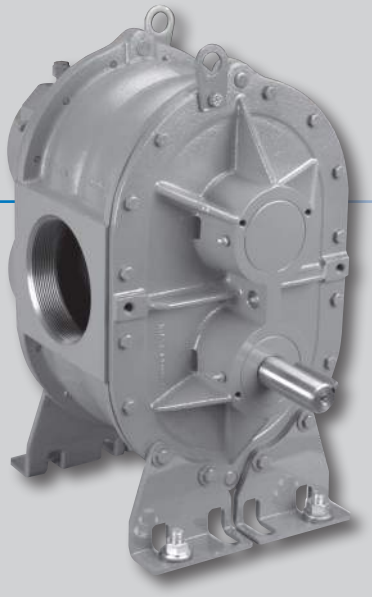
DRESSER Roots

The original ROOTS blower still leads the way™

ROOTS™ UNIVERSAL RAI® Rotary Positive Displacement Blowers



Specifications Frames 22 thru 718

DESIGN AND CONSTRUCTION FEATURES

- Steel detachable mounting feet
- Rigid one-piece cast iron casing
- Anti-friction bearings
- Thrust control
- Splash oil lubricated spur timing gears
- Connections in standard pipe sizes
- Balanced, precision machined bi-lobe impellers
- Ground steel shafts

Basic Blower Description

Universal RAI blowers are heavy duty blowers designed with detachable rugged steel mounting feet that permit easy in-field adaptability to either vertical or horizontal installation requirements.

Because of the detachable mounting feet, these units can be easily adapted to any of four drive shaft positions - right hand, left hand, bottom or top. The compact, sturdy design is engineered for continuous service when operated in accordance with speed and pressure ratings.

The basic model consists of a cast iron casing and cast iron involute impellers. Carburized and ground alloy steel spur timing gears are secured to the steel shafts with a taper mounting and locknut. Oversized antifriction bearings are used, with a cylindrical roller bearing at the drive shaft to withstand V-belt pull. The Universal RAI features thrust control, with splash oil lube on the gear end and grease lube on the drive end.

Available accessories include driver, relief valve, inlet and discharge silencers, inlet filter, check valve, extended base, v-belt or flexible coupling and drive guards.

Strongest Warranty in the Industry

ROOTS™ Universal RAI® blowers are warranted for two years plus an additional 6 months for shipping and construction where required. ROOTS synthetic oil is recommended for longer lubricant life.

Vertical Gear End

Horizontal Gear End

Horizontal Drive End

Exclusive gearbox design - "Figure 8" gearbox improves oil distribution for longer gear and bearing life with smoother operation.

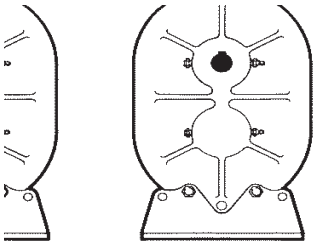
Original ROOTS impeller design - Dynamically balanced ROOTS impellers are center-timed to allow either clockwise or counterclockwise rotation.

Taper mounted timing gears - Carburized and ground alloy steel gears are precision machined and taper fitted to alloy steel shafts, eliminating the need for unreliable timing pins.

Rugged steel mounting feet - The Universal RAI can be easily changed from horizontal flow to vertical flow using the same mounting feet. They're even interchangeable with the mounting holes of similar competitive blowers.

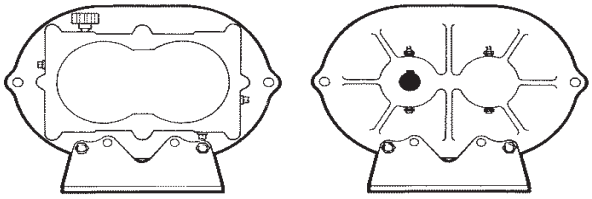
Long-life anti-friction bearings - Oversized cylindrical roller bearings at the drive shaft handle v-belt load; all bearing points are engineered for long service life.

Versatile mounting - You can mount the Universal RAI in multiple positions to accommodate your specific needs. With your choice of 17 frame sizes, there's a URAI that fits right into your OEM or replacement application.



Vertical Gear End Drive Shaft Bottom Drive Shaft on Top

Vertical Mounting (Horizontal Air Flow)



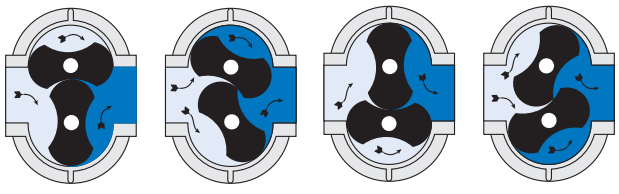
Horizontal Gear End Drive Shaft on Left Drive Shaft on Right

Horizontal Mounting (Vertical Air Flow)

Bi-Lobe Operating Principle

Two figure-eight lobe impellers mounted on parallel shafts rotate in opposite directions. As each impeller passes the blower inlet, it traps a finite volume of air and carries it around the case to the blower outlet, where the air is discharged. With constant speed operation, the displaced volume is essentially the same regardless of pressure,

temperature or barometric pressure. Timing gears control the relative position of the impellers to each other and maintain small but finite clearances. This allows operation without lubrication being required inside the lobe cavity.



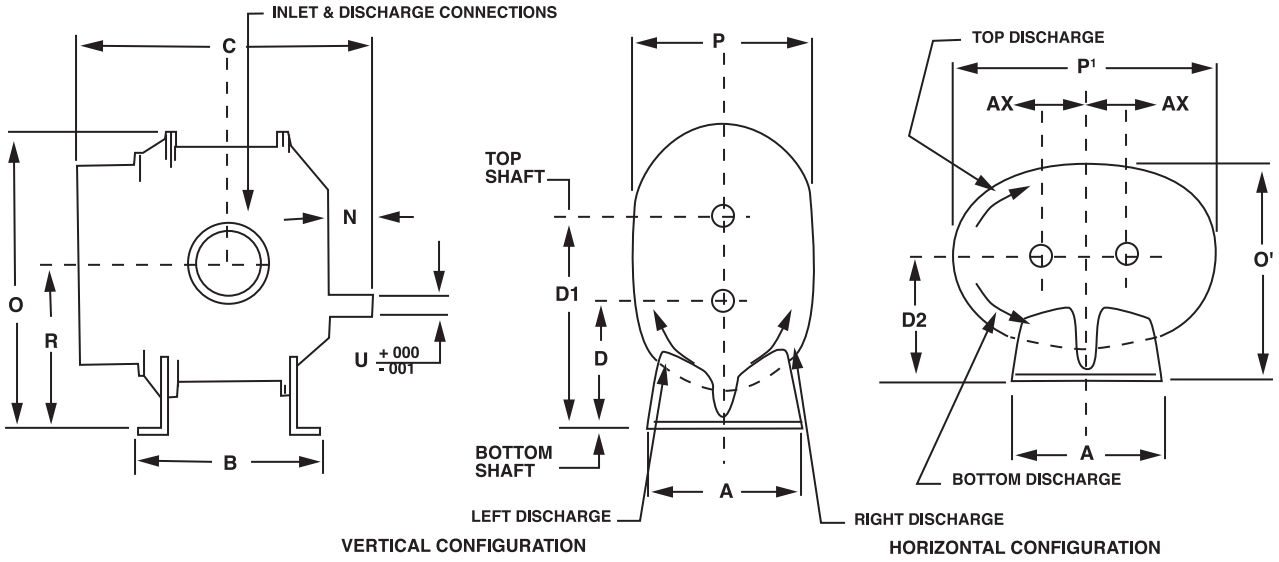
POSITION 1 POSITION 2 POSITION 3 POSITION 4

URAI Blower Performance

Frame Size	Speed RPM	1 PSI		6 PSI		7 PSI		10 PSI		12 PSI		13 PSI		14 PSI		15 PSI		Maximum Vacuum		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	"HGV	CFM	BHP
	1160	10	0.1															4	6	0.2
22	3600	49	0.3	38	1.6	36	1.8	32	2.6	29	3.1							14	28	1.8
	5275	76	0.5	64	2.4	63	2.7	59	3.8	56	4.6							15	53	2.8
	1160	24	0.2															6	12	0.5
24	3600	102	0.6	83	3.1	81	3.6											14	69	3.5
	5275	156	0.9	137	4.6	135	5.4											15	119	5.5
	1160	40	0.2	21	1.4	19	1.6											10	18	1.1
32	2800	113	0.6	95	3.4	93	3.9	86	5.6	82	6.7	81	7.2	79	7.8	77	8.3	15	78	4.1
	3600	149	0.9	131	4.4	129	5.2	122	7.3	118	8.7	117	9.4	115	10.1	113	10.8	16	110	5.3
	1160	55	0.3	31	1.9	28	2.2											10	27	1.5
33	2800	156	0.9	132	4.6	129	5.4	120	7.7	116	9.2							14	113	5.2
	3600	205	1.2	181	6.1	178	7	170	9.9	165	11.9							15	159	7.3
	1160	95	0.5	61	3.1	57	3.6											10	55	2.5
36	2800	262	1.5	229	7.7	224	8.9											12	213	7.5
	3600	344	2.1	310	10.1	306	11.7											15	278	12.1
	860	38	0.2	18	1.4	15	1.6											8	19	0.9
42	1760	92	0.5	72	2.8	69	3.3	62	4.7	58	5.6							14	56	3.2
	3600	204	1.4	183	6.1	181	7.1	173	9.9	169	11.8	167	12.8	165	13.7	163	14.7	16	160	7.7
	860	79	0.5	42	2.7	37	3.2											8	46	1.8
45	1760	188	1	151	5.7	146	6.6	133	9.4									12	134	5.5
	3600	410	2.7	374	12.2	369	14.1	356	19.8									16	332	15.4
	860	105	0.6	59	3.6	53	4.2											8	63	2.4
47	1760	249	1.3	203	7.5	196	8.7											12	181	7.3
	3600	542	3.5	496	16.1	490	18.6											15	452	19.1
	700	72	0.4	42	2.4	38	2.8											10	36	2
53	1760	211	1.2	181	6.3	177	7.3	167	10.3	160	12.3	157	13.3	155	14.4			14	158	7.1
	2850	355	2.5	325	10.7	321	12.3	310	17.2	304	20.5	301	22.1	298	23.8	295	25.4	16	291	13.4
	700	123	0.7	78	4.1	72	4.7											10	70	3.3
56	1760	358	2	312	10.5	306	12.2	290	17.3	280	20.6	276	22.3					14	276	11.8
	2850	598	4	553	17.7	547	20.5	531	28.7	521	34.2	517	37					16	501	22.4
	700	187	1	130	5.9													8	135	3.9
59	1760	529	2.9	472	15.3	464	17.8											12	445	14.9
	2850	881	5.9	824	26	816	30											15	770	30.8
	700	140	0.8	93	4.5	86	5.3	70	7.5									12	71	4.4
65	1760	400	2.4	353	11.9	347	13.8	330	19.4	320	23.2	316	25.1	311	27	307	28.9	16	300	15.2
	2350	546	3.8	499	16.4	492	19	475	26.5	466	31.6	461	34.1	457	36.6	452	39.1	16	445	25.6
	700	224	1.2	149	7.3	139	8.5											10	135	5.9
68	1760	643	3.7	567	18.9	557	21.9	530	31	515	37	507	40.1	500	43.1			15	495	22.7
	2350	876	5.6	801	25.9	790	29.9	763	42.1	748	50.2	740	54.2	733	58.3			16	715	32.8
	700	420	2.3	279	13.6	260	15.9											8	292	8.9
615	1760	1205	6.6	1063	34.9	1044	40.6											12	997	33.9
	2350	1641	9.7	1500	47.6	1481	55.2											14	1389	53.4
	575	192	1.1	134	6.1	126	7.1	105	10.2									12	117	6
76	1400	527	3	468	15.4	460	17.8	439	25.3	427	30.2	421	32.7	415	35.1	410	37.6	16	413	19.7
	2050	790	5.3	731	23.4	723	27	702	37.9	690	45.1	684	48.7	679	52.4	673	56	16	674	29.5
	575	362	1.9	271	11.1	258	13	226	18.6									12	228	10.9
711	1400	970	5.2	880	27.7	867	32.2	835	45.7									15	793	33.5
	2050	1450	8.8	1359	41.8	1347	48.4	1315	68.2									16	1256	53.1
	575	600	3.1	470	18.1													10	446	14.8
718	1400	1590	8.1	1460	44.8													12	1398	43.6
	2050	2370	13.3	2240	66.9													12	2178	64.7

Notes: 1. Performance based on inlet air at standard pressure of 14.7 psia, standard temperature of 68° F, and specific gravity of 1.0.
2. Vacuum ratings based on inlet air at standard temperature of 68°F, discharge pressure of 30" Hg and specific gravity of 1.0.

Outline Drawing and Dimensions



Universal RAI® Blower Dimensions

Frame Size	A	B	C	Drive Shaft Location			N	O	O1	P	P1	R	U	Keyway	Inlet & Disch. Dia.	AX	Approx Net Wt. (lbs.)
				D	D1	D2											
22	5.13	5.00	9.75	3.75	6.25	3.75	2.50	9.63	6.88	6.25	9.25	5.00	.625	.188 x .094	1.0 NPT	1.25	32
24	5.13	7.00	11.75	3.75	6.25	3.75	2.50	9.63	6.88	6.25	9.25	5.00	.625	.188 x .094	2.0 NPT	1.25	43
32	7.25	6.75	11.25	5.00	8.50	5.00	2.44	12.81	8.88	7.75	12.13	6.75	.750	.188 x .094	1.25 NPT	1.75	69
33	7.25	7.63	12.13	5.00	8.50	5.00	2.44	12.81	8.88	7.75	12.13	6.75	.750	.188 x .094	2.0 NPT	1.75	74
36	7.25	10.00	14.63	5.00	8.50	5.00	2.56	12.81	8.88	7.75	12.13	6.75	.750	.188 x .094	2.5 NPT	1.75	102
42	8.00	7.25	13.00	6.25	10.25	6.25	3.18	15.06	10.63	8.75	13.63	8.25	.875	.188 x .094	1.5 NPT	2.00	88
45	8.00	10.00	15.50	6.25	10.25	6.25	2.94	15.06	10.63	8.75	13.63	8.25	.875	.188 x .094	2.5 NPT	2.00	109
47	8.00	11.75	17.63	6.25	10.25	6.25	3.31	15.06	10.50	8.50	13.63	8.25	.875	.188 x .094	3.0 NPT	2.00	128
53	10.50	8.38	15.38	6.25	11.25	6.75	3.68	17.38	11.88	10.25	17.25	8.75	1.125	.250 x .125	2.5 NPT	2.50	143
56	10.50	11.00	18.00	6.25	11.25	6.75	3.38	17.38	12.25	11.00	17.25	8.75	1.125	.250 x .125	4.0 NPT	2.50	170
59	10.50	14.00	21.18	6.25	11.25	6.75	3.88	17.38	12.25	11.00	17.25	8.75	1.125	.250 x .125	4.0 NPT	2.50	204
65	11.00*	10.00	18.38	8.75	14.75	8.75	3.56	21.63	15.13	12.75	19.75	11.75	1.375	.312 x .156	3.0 NPT	3.00	245
68	11.00*	13.00	21.38	8.75	14.75	8.75	3.69	21.63	15.13	12.75	19.75	11.75	1.375	.312 x .156	5.0 NPT	3.00	285
615	11.00*	20.00	28.38	8.75	14.75	8.75	3.69	21.63	16.25	15.00	19.75	11.75	1.375	.312 x .156	6.0 FLG	3.00	425
76	14.00**	11.75	19.94	11.00	18.00	11	4.06	26.13	20.69	19.38	23.25	14.50	1.562	.375 x .188	4.0 NPT	3.50	400
711	14.00**	16.75	25.19	11.00	18.00	11	4.31	26.13	19.50	17.00	23.25	14.50	1.562	.375 x .188	6.0 FLG	3.50	530
718	14.00**	23.75	32.19	11.00	18.00	11	4.31	26.13	19.50	17.00	23.25	14.50	1.562	.375 x .188	8.0 FLG	3.50	650

*17.00 in horizontal configuration
**21.00 in horizontal configuration

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S-12K84 rev. 0810

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Appendix F

Field / Sampling Data Sheets

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Date	Run #	SVE-1 approx %	SVE-2 approx %	Time	Vacuum - Pre-manifold (SV-1) (in H2O)	Vacuum - Pre-manifold (SV-2) (in H2O)	Total Vacuum Post-Moisture Separator (in H2O)	SV-1 Velocity FPM	SV-1 Airflow (SFM)	SV-2 Velocity FPM	SV-2 Airflow (SFM)	Stack Temp (F)	PID Reading Effluent (ppm)	TO-15 Sample Collected	Dilution Air approx %	Notes
11/16/2015	1	100	100	12:21:00 PM	NA*	NA*	-19	NA*	NA*	NA*	NA*	NA*	906		0	NA*- H2K Installed Gauges not working properly
11/16/2015		100	100	12:52:00 PM	NA*	NA*	-25	NA*	NA*	NA*	NA*	NA*	1070	**E-1**	0	NA*- H2K Installed Gauges not working properly
11/16/2015		100	100	1:45:00 PM	-20.6	-20.6	-25	700	34	1140	55	65	1010		0	Switched to hand measurements with fluke
11/16/2015		100	100	2:35:00 PM	-22.8	-22.5	-22.5	1100	40	1415	69	70	1025		0	
11/16/2015		100	100	3:22:00 PM	-31.1	-32.2	-29	1200	55	1880	75	72	1126		0	
11/16/2015		100	100	4:02:00 PM	-31.9	-31.9	-30	750	51	1065	59	70	1087		0	
11/17/2015	2	100	0	8:53:00 AM	-43.4	--	-40	1300	62	--	--	74	1100		0	
11/17/2015		100	0	9:54:00 AM	-50.5	--	-41	1132	57	--	--	76	945		0	
11/17/2015		100	0	10:35:00 AM	-51.5	--	-49	1128	55	--	--	83	977		0	
11/17/2015		100	0	11:33:00 AM	-50.3	--	-45	1147	56	--	--	85	978		0	
11/17/2015		100	0	12:57:00 PM	-51	--	-50	1135	55	--	--	80	1498		0	
11/17/2015	3	100	100	1:18:00 PM	-37	-37.4	-32	760	36	1400	86	75	1216	**E-2**	0	1:02 PM - Opened both wells for TO-15 sample
11/17/2015	4	0	100	1:26:00 PM	--	-51.6	-49	--	--	1300	58	80	1104		0	
11/17/2015		0	100	2:08:00 PM	--	-53.5	-50	--	--	1376	60	82	1036		0	
11/17/2015		0	100	12:00:00 AM	--	-54.4	-50	--	--	1270	61	77	939		0	
11/17/2015		0	100	3:32:00 PM	--	-53.8	-50	--	--	1149	57	80	1066		0	

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

11/18/2015	5	100	0	8:50:00 AM	-25	--	-23	806	37	--	--	72	1250		50	Tweaked dilution air valve to keep vacuum @ -25(in H20)
11/18/2015		100	0	9:44:00 AM	-25	--	-22	750	31	--	--	73	1437		50	Tweaked dilution air valve to keep vacuum @ -25(in H20)
11/18/2015		100	0	10:30:00 AM	-25	--	-23	950	51	--	--	73	1452		50	Tweaked dilution air valve to keep vacuum @ -25(in H20)
11/18/2015		100	0	11:25:00 AM	-25	--	-21	900	45	--	--	73	1455		50	Tweaked dilution air valve to keep vacuum @ -25(in H20)
11/18/2015	6	0	100	11:55:00 AM	--	-26.5	--	--	--	--	--	--	--		50	Set vacuum to -26.5(in H20) then waited appx 1 hour for system to equilibrate.
11/18/2015		0	100	1:21:00 PM	--	-26.8	-22	--	--	929	46	74	1313		50	Vac - SV-2 -27.5(in H20) - Opened dilution to get to -26.8(in H20)
11/18/2015		0	100	2:20:00 PM	--	-27	-22	--	--	862	43	73	1372		50	
11/18/2015		0	100	2:55:00 PM	--	-27.9	-22.5	--	--	815	43	73	1460		50	
11/18/2015		0	100	3:33:00 PM	--	-28	-23	--	--	820	42	70	1487		50	
11/18/2015	7	100	100	4:00:00 PM	-33	-33	-31.5	946	47	883	44	74	1699	**E-3**	0	Opened both wells for TO-15 sample

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run #			B4 Startup							
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	9:48:00 AM	0.00						
P-1S	29	40	9:50:00 AM	0.11						
P-2S	42	18	9:45:00 AM	-0.03						
P-2D	42	18	9:45:00 AM	0.02						
P-3S	27	21	9:55:00 AM	0.05						
P-3D	27	21	9:55:00 AM	0.04						
P-4D	70	70	10:00:00 AM	0.02						
P-5S	151	149	10:05:00 AM	0.03						
MW-1	157	155	10:10:00 AM	0.05						
P-6D	87	61	10:12:00 AM	0.05						
P-7S	78	81	10:15:00 AM	-0.07						
P-7D	78	81	10:15:00 AM	0.08						
P-8D	116	117	10:20:00 AM	0.14						
MW-11	140	144	10:22:00 AM	0.09						
P-9S	76	104	10:25:00 AM	0.05						
P-9D	76	104	10:25:00 AM	0.10						
P-10S	134	158	10:30:00 AM	0.09						
P-10D	134	158	10:30:00 AM	0.09						
MW-7	101	126	10:45:00 AM	0.13						
MW-8	149	176	10:50:00 AM	0.11						
MW-9	217	241	11:45:00 AM	0.08						
MW-6	362	386	11:00:00 AM	0.03						
MW-6A	365	393	11:00:00 AM	0.01						
MW-10	522	552	11:15:00 AM	0.01						

Notes:

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 1 Shallow

Monitoring Point ID	Distance from SV-1 (ft.)	Distance from SV-2 (ft.)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)
P-1S	29	40	12:51 PM	-4.54	2:06 PM	-4.90	3:01:00 PM	-5.62	3:42 PM	-5.75	4:11 PM	-5.02
P-2S	42	18	12:52 PM	-8.31	2:07 PM	-9.12	3:03:00 PM	-11.34	3:43 PM	-11.43	4:11 PM	-10.87
P-3S	27	21	12:53 PM	-2.51	2:10 PM	-0.42	3:05:00 PM	0.10	3:45 PM	-0.32	4:15 PM	-0.33
P-5S	151	149	12:55 PM	-0.11	2:15 PM	-0.51	3:09:00 PM	-0.59	3:48 PM	-0.25	4:20 PM	-0.25
P-7S	78	81	12:58 PM	-1.49	2:17 PM	-2.10	3:15:00 PM	-2.43	3:52 PM	-2.57	4:26 PM	-2.42
P-9S	76	104	1:05 PM	-0.72	2:22 PM	-0.60	3:20:00 PM	-0.80	3:54 PM	-0.79	4:30 PM	-0.79
P-10S	134	158	1:06 PM	-0.50	2:24 PM	-0.47	3:23:00 PM	-0.62	3:56 PM	-0.63	4:32 PM	-0.63

Notes: Shallow Monitoring Points Only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 1 Deep												
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	12:50:00 PM	0.00	2:05:00 PM	-0.05	3:00:00 PM	-0.43	3:41:00 PM	-0.02	4:09:00 PM	-0.05
P-2D	42	18	12:52:00 PM	-8.78	2:08:00 PM	-9.77	3:03:00 PM	-11.96	3:44:00 PM	-12.01	4:11:00 PM	-11.49
P-3D	27	21	12:53:00 PM	-11.40	2:12:00 PM	-12.05	3:06:00 PM	-14.10	3:46:00 PM	-14.16	4:17:00 PM	-13.85
P-4D	70	70	12:54:00 PM	-3.61	2:13:00 PM	-4.24	3:08:00 PM	-5.30	3:46:00 PM	-5.47	4:18:00 PM	-5.35
MW-1	157	155	12:56:00 PM	-0.32	2:14:00 PM	-0.18	3:10:00 PM	-0.18	3:48:00 PM	-0.80	4:21:00 PM	-0.69
P-6D	87	61	12:57:00 PM	-3.38	2:16:00 PM	-3.68	3:12:00 PM	-4.23	3:50:00 PM	-4.55	4:25:00 PM	-4.48
P-7D	78	81	12:58:00 PM	-3.12	2:19:00 PM	-3.43	3:16:00 PM	-4.14	3:53:00 PM	-4.24	4:27:00 PM	-4.16
P-8D	116	117	1:00:00 PM	-1.03	2:21:00 PM	-1.11	3:18:00 PM	-1.42	3:53:00 PM	-1.49	4:28:00 PM	-1.46
MW-11	140	144	1:01:00 PM	-0.42	2:20:00 PM	-0.48	3:19:00 PM	-0.66	3:54:00 PM	-0.57	4:29:00 PM	-0.58
P-9D	76	104	1:05:00 PM	-1.80	2:23:00 PM	-1.68	3:21:00 PM	-2.08	3:55:00 PM	-2.14	4:30:00 PM	-2.08
P-10D	134	158	1:06:00 PM	-0.76	2:25:00 PM	-0.65	3:24:00 PM	-0.90	3:57:00 PM	-0.91	4:32:00 PM	-0.91
MW-7	101	126	1:10:00 PM	-1.42	2:26:00 PM	-1.50	3:25:00 PM	-1.84	3:56:00 PM	-1.78	4:31:00 PM	-1.75
MW-8	149	176	1:11:00 PM	-0.44	2:27:00 PM	-0.32	3:26:00 PM	-0.67	3:58:00 PM	-0.55	4:32:00 PM	-0.54
MW-9	217	241	1:12:00 PM	-0.02	2:29:00 PM	-0.60	3:27:00 PM	-0.11	3:59:00 PM	-0.43	4:35:00 PM	-0.38
MW-6	362	386	1:13:00 PM	0.03	2:30:00 PM	0.03	3:30:00 PM	-0.51	4:00:00 PM	0.00	4:40:00 PM	0.00
MW-6A	365	393	1:13:00 PM	0.01								
MW-10	522	552	1:14:00 PM	0.01								

Notes: Deep monitoring points only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 2 Shallow										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
P-1S	29	40	9:24:00 AM	-5.08	10:15:00 AM	-5.17	11:08:00 AM	-5.22	12:35:00 PM	-5.42
P-2S	42	18	9:26:00 AM	-6.71	10:15:00 AM	-7.83	11:09:00 AM	-8.12	12:36:00 PM	-8.24
P-3S	27	21	9:28:00 AM	-0.13	10:17:00 AM	-0.20	11:10:00 AM	0.10	12:38:00 PM	-0.80
P-5S	151	149	9:31:00 AM	-0.11	10:19:00 AM	-0.20	11:13:00 AM	-0.19	12:42:00 PM	-0.20
P-7S	78	81	9:35:00 AM	-1.23	10:21:00 AM	-1.59	11:16:00 AM	-3.31	12:45:00 PM	-3.30
P-9S	76	104	9:39:00 AM	-0.73	10:24:00 AM	-0.84	11:20:00 AM	-0.83	12:49:00 PM	-0.86
P-10S	134	158	9:41:00 AM	-0.48	10:27:00 AM	-0.60	11:22:00 AM	-0.55	12:51:00 PM	-0.56

Notes: Shallow monitoring points only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 2 Deep										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	9:23:00 AM	0.00	10:14:00 AM	0.00	11:07:00 AM	0.01	12:34:00 PM	0.00
P-2D	42	18	9:27:00 AM	-7.05	10:16:00 AM	-8.16	11:09:00 AM	-8.44	12:37:00 PM	-8.54
P-3D	27	21	9:29:00 AM	-10.59	10:17:00 AM	-11.68	11:11:00 AM	-11.98	12:40:00 PM	-12.12
P-4D	70	70	9:30:00 AM	-3.78	10:18:00 AM	-4.57	11:12:00 AM	-4.76	12:41:00 PM	-4.84
MW-1	157	155	9:32:00 AM	-0.32	10:19:00 AM	-0.51	11:14:00 AM	-0.51	12:43:00 PM	-0.52
P-6D	87	61	9:34:00 AM	-2.56	10:20:00 AM	-3.03	11:15:00 AM	-3.17	12:44:00 PM	-3.16
P-7D	78	81	9:36:00 AM	-3.44	10:21:00 AM	-3.95	11:17:00 AM	-4.04	12:47:00 PM	-4.07
P-8D	116	117	9:37:00 AM	-1.07	10:22:00 AM	-1.33	11:18:00 AM	-1.33	12:48:00 PM	-1.33
MW-11	140	144	9:38:00 AM	-0.47	10:22:00 AM	-0.61	11:19:00 AM	-0.60	12:49:00 PM	-0.57
P-9D	76	104	9:40:00 AM	-1.93	10:24:00 AM	-2.20	11:21:00 AM	-2.21	12:50:00 PM	-2.24
P-10D	134	158	9:42:00 AM	-0.73	10:27:00 AM	-0.89	11:22:00 AM	-0.84	12:52:00 PM	-0.86
MW-7	101	126	9:43:00 AM	-1.68	10:26:00 AM	-1.98	11:23:00 AM	-1.98	12:51:00 PM	-1.97
MW-8	149	176	9:44:00 AM	-0.47	10:28:00 AM	-0.55	11:24:00 AM	-0.55	12:53:00 PM	-0.55
MW-9	217	241	9:45:00 AM	-0.03	10:29:00 AM	-0.04	11:25:00 AM	-0.02	12:54:00 PM	-0.01
MW-6	362	386	9:46:00 AM	0.03	10:30:00 AM	0.03	--	--	--	--
MW-6A	365	393	--	--	--	--	--	--	--	--
MW-10	522	552	--	--	--	--	--	--	--	--

Notes: Deep monitoring points only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 4 Shallow

Monitoring Point ID	Distance from SV-1 (ft.)	Distance from SV-2 (ft.)	Time	Differential Pressure Reading (in WC)	Time	Differential Pressure Reading (in WC)	Differential Pressure Reading (in WC)
P-1S	29	40	1:38:00 PM	-3.46	2:30:00 PM	-3.26	-3.17
P-2S	42	18	1:39:00 PM	-13.20	2:32:00 PM	-13.78	-13.74
P-3S	27	21	1:42:00 PM	-0.88	2:34:00 PM	-0.94	-0.84
P-5S	151	149	1:45:00 PM	-0.20	2:39:00 PM	-0.21	-0.31
P-7S	78	81	1:53:00 PM	-2.93	2:42:00 PM	-2.89	-3.57
P-9S	76	104	1:56:00 PM	-0.56	2:50:00 PM	-0.57	-0.61
P-10S	134	158	1:57:00 PM	-0.44	2:53:00 PM	-0.45	-0.51

Notes: Shallow monitoring points only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 4 Deep								
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	1:37:00 PM	0.00	2:29:00 PM	0.00	3:10:00 PM	0.00
P-2D	42	18	1:40:00 PM	-13.97	2:33:00 PM	-14.56	3:12:00 PM	-14.45
P-3D	27	21	1:43:00 PM	-14.16	2:36:00 PM	-14.60	3:14:00 PM	-14.50
P-4D	70	70	1:44:00 PM	-5.07	2:37:00 PM	-5.26	3:15:00 PM	-5.42
MW-1	157	155	1:46:00 PM	-0.56	2:40:00 PM	-0.58	3:16:00 PM	-0.79
P-6D	87	61	1:47:00 PM	-4.97	2:41:00 PM	-5.29	3:17:00 PM	-5.41
P-7D	78	81	1:53:00 PM	-3.58	2:43:00 PM	-3.57	3:20:00 PM	-3.69
P-8D	116	117	1:54:00 PM	-1.21	2:47:00 PM	-1.21	3:21:00 PM	-1.31
MW-11	140	144	1:55:00 PM	-0.55	2:48:00 PM	-0.54	3:22:00 PM	-0.62
P-9D	76	104	1:56:00 PM	-1.47	2:51:00 PM	-1.45	3:24:00 PM	-1.54
P-10D	134	158	1:57:00 PM	-0.64	2:53:00 PM	-0.63	3:25:00 PM	-0.73
MW-7	101	126	1:58:00 PM	-1.38	2:52:00 PM	-1.37	3:26:00 PM	-1.45
MW-8	149	176	1:59:00 PM	-0.45	2:54:00 PM	-0.42	3:27:00 PM	-0.52
MW-9	217	241	2:00:00 PM	0.04	2:55:00 PM	-0.01	3:28:00 PM	-0.11
MW-6	362	386	2:02:00 PM	0.08				
MW-6A	365	393	--	--				
MW-10	522	552	--	--				

Notes: Deep monitoring points only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 5 Shallow										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
P-1S	29	40	9:17:00 AM	0.43	10:07:00 AM	0.30	10:57:00 AM	0.38	11:28:00 AM	0.20
P-2S	42	18	9:18:00 AM	-1.38	10:08:00 AM	-2.21	10:58:00 AM	-2.42	11:29:00 AM	-2.44
P-3S	27	21	9:19:00 AM	-0.03	10:10:00 AM	-0.13	11:01:00 AM	-0.20	11:30:00 AM	-0.20
P-5S	151	149	9:21:00 AM	-0.04	10:13:00 AM	-0.10	11:04:00 AM	-0.06	11:34:00 AM	-0.06
P-7S	78	81	9:27:00 AM	-0.01	10:16:00 AM	0.21	11:06:00 AM	0.74	11:36:00 AM	0.15
P-9S	76	104	9:32:00 AM	-0.38	10:21:00 AM	-0.47	11:12:00 AM	-0.40	11:40:00 AM	-0.43
P-10S	134	158	9:34:00 AM	-0.23	10:23:00 AM	-0.38	11:13:00 AM	-0.26	11:42:00 AM	-0.29

Notes: Shallow monitoring points only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 5 Deep										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	9:16:00 AM	0.05	10:06:00 AM	0.03	10:57:00 AM	-0.07	11:27:00 AM	-0.07
P-2D	42	18	9:18:00 AM	-3.70	10:09:00 AM	-4.45	11:00:00 AM	-4.57	11:29:00 AM	-4.51
P-3D	27	21	9:19:00 AM	-5.60	10:11:00 AM	-6.33	11:02:00 AM	-6.43	11:30:00 AM	-6.35
P-4D	70	70	9:20:00 AM	-2.04	10:12:00 AM	-2.69	11:03:00 AM	-2.61	11:32:00 AM	-2.59
MW-1	157	155	9:22:00 AM	-0.15	10:14:00 AM	-0.31	11:04:00 AM	-0.24	11:34:00 AM	-0.22
P-6D	87	61	9:25:00 AM	-1.39	10:15:00 AM	-1.75	11:05:00 AM	-1.77	11:35:00 AM	-1.75
P-7D	78	81	9:28:00 AM	-1.85	10:17:00 AM	-2.22	11:07:00 AM	-2.21	11:37:00 AM	-2.19
P-8D	116	117	9:30:00 AM	-0.63	10:19:00 AM	-0.82	11:10:00 AM	-0.78	11:38:00 AM	-0.78
MW-11	140	144	9:31:00 AM	-0.26	10:20:00 AM	-0.35	11:11:00 AM	-0.35	11:39:00 AM	-0.32
P-9D	76	104	9:33:00 AM	-1.02	10:22:00 AM	-1.26	11:12:00 AM	-1.10	11:40:00 AM	-1.20
P-10D	134	158	9:35:00 AM	-0.39	10:24:00 AM	-0.54	11:13:00 AM	-0.38	11:42:00 AM	-0.47
MW-7	101	126	9:36:00 AM	-0.86	10:23:00 AM	-1.08	11:14:00 AM	-0.79	11:41:00 AM	-0.92
MW-8	149	176	9:37:00 AM	-0.25	10:25:00 AM	-0.37	11:14:00 AM	-0.26	11:43:00 AM	-0.26
MW-9	217	241	9:38:00 AM	-0.02	10:26:00 AM	-0.03	11:15:00 AM	0.03	11:44:00 AM	-0.03
MW-6	362	386								
MW-6A	365	393								
MW-10	522	552								

Notes: Deep monitoring points only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 6 Shallow										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
P-1S	29	40	12:55:00 PM	0.33	1:54:00 PM	0.30	2:30:00 PM	0.29	3:12:00 PM	0.40
P-2S	42	18	12:56:00 PM	-2.64	1:55:00 PM	-2.62	2:31:00 PM	-2.51	3:13:00 PM	-2.50
P-3S	27	21	12:58:00 PM	-0.15	1:56:00 PM	-0.14	2:33:00 PM	-0.13	3:14:00 PM	-0.09
P-5S	151	149	1:00:00 PM	-0.38	2:00:00 PM	-0.07	2:36:00 PM	-0.07	3:18:00 PM	-0.80
P-7S	78	81	1:03:00 PM	0.55	2:04:00 PM	0.20	2:40:00 PM	0.07	3:21:00 PM	0.11
P-9S	76	104	1:08:00 PM	-0.61	2:08:00 PM	-0.28	2:43:00 PM	-0.24	3:25:00 PM	-0.29
P-10S	134	158	1:10:00 PM	-0.49	2:10:00 PM	-0.25	2:44:00 PM	-0.19	3:26:00 PM	-0.24

Notes: Shallow monitoring points only

Pilot Test Data Sheet
Former Union 76
Mille Lacs Oil
Cambridge, MN

Run # 6 Deep										
Monitoring Point ID	**Distance from SV-1 (ft.)**	**Distance from SV-2 (ft.)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**	**Time**	**Differential Pressure Reading (in WC)**
MW-3	18	27	12:54:00 PM	-0.04	1:54:00 PM	-0.05	2:29:00 PM	0.31	3:12:00 PM	-0.06
P-2D	42	18	12:57:00 PM	-7.38	1:56:00 PM	-7.31	2:32:00 PM	-6.96	3:13:00 PM	-7.00
P-3D	27	21	12:58:00 PM	-7.44	1:57:00 PM	-7.32	2:33:00 PM	-6.95	3:15:00 PM	-6.99
P-4D	70	70	12:59:00 PM	-2.74	1:59:00 PM	-2.87	2:34:00 PM	-2.65	3:16:00 PM	-2.74
MW-1	157	155	1:01:00 PM	-0.62	2:01:00 PM	-0.33	2:37:00 PM	-0.31	3:19:00 PM	-0.35
P-6D	87	61	1:02:00 PM	-3.11	2:03:00 PM	-2.84	2:38:00 PM	-2.75	3:20:00 PM	-2.77
P-7D	78	81	1:04:00 PM	-2.17	2:04:00 PM	-1.90	2:41:00 PM	-1.83	3:22:00 PM	-1.90
P-8D	116	117	1:05:00 PM	-0.94	2:05:00 PM	-0.72	2:42:00 PM	-0.67	3:23:00 PM	-0.74
MW-11	140	144	1:07:00 PM	-0.55	2:06:00 PM	-0.31	2:42:00 PM	-0.28	3:23:00 PM	-0.34
P-9D	76	104	1:09:00 PM	-1.08	2:09:00 PM	-0.79	2:43:00 PM	-0.71	3:25:00 PM	-0.77
P-10D	134	158	1:10:00 PM	-0.59	2:11:00 PM	-0.35	2:44:00 PM	-0.30	3:27:00 PM	-0.38
MW-7	101	126	1:11:00 PM	-0.97	2:09:00 PM	-0.60	2:45:00 PM	-0.55	3:26:00 PM	-0.63
MW-8	149	176	1:12:00 PM	-0.56	2:15:00 PM	-0.33	2:46:00 PM	-0.17	3:27:00 PM	-0.24
MW-9	217	241	1:13:00 PM	-0.30	2:12:00 PM	-0.03	2:47:00 PM	-0.02	3:28:00 PM	-0.05
MW-6	362	386	1:14:00 PM	-0.29	2:13:00 PM	-0.05	2:48:00 PM	0.02	3:29:00 PM	-0.03
MW-6A	365	393								
MW-10	522	552								

Notes: Deep monitoring points only

Appendix G

Updated Life-Cycle Cost Estimate

Life Cycle Cost Sheet - SVE/Air Sparge

Description	Quantity	Price	Unit	Total
Access Agreements	3	$1,210	per property	$3,630
Pilot test work plan	1	$6,000	report	$6,000
Pilot test equipment	1	$5,000	equipment	$5,000
Pilot test holes for radius of influence	12	$1,000	per pilot hole	$12,000
Pilot test observation	6	$1,000	per day	$6,000
Pilot test report	1	$6,000	report	$6,000
SDCAD Report	1	$6,000	report	$6,000
SVE/Sparge well install	10	$1,500	per well	$15,000
Well Installation Oversight	5	$1,000	per day	$5,000
Blower/skid fabrication, delivery	2	$24,000	system	$48,000
Trenching, electrical, construction	2	$45,000	lump sum	$90,000
Construction Oversight	10	$1,000	day	$10,000
Start-up/optimization	5	$1,000	day	$5,000
Start-up sampling	10	$250	per sample	$2,500
Installation Report	1	$6,000	report	$6,000
TOTAL CAPITOL				**$226,130**
Annual Monitoring (LIF sampling, monitoring well sampling, vent sampling)	3	$25,000	per year	$75,000
Annual Operation (Electrical, maintenance)	3	$3,000	lump sum	$9,000
TOTAL ANNUAL				**$84,000**
System shut-down oversight	5	$1,000	day	$5,000
Well sealing	20	$1,500	per well	$30,000
TOTAL SHUT-DOWN				**$35,000**
20% Contingency				$62,026
Total				**$407,156**

Life Cycle Cost Sheet - Dual Phase

Description	Quantity	Price	Unit	Total
Access Agreements	4	$1,210	per property	$4,840
Pilot test work plan	1	$6,000	report	$6,000
Pilot test equipment	1	$3,000	equipment	$3,000
Pilot test holes for radius of influence	12	$1,000	per pilot hole	$12,000
Pilot test observation	5	$1,000	per day	$5,000
Pilot test report	1	$6,000	report	$6,000
Corrective Action Design	1	$6,000	report	$6,000
SVE/Extraction well install	24	$1,500	per well	$36,000
Well Installation Oversight	10	$1,000	per day	$10,000
Blower/skid fabrication, delivery	2	$24,000	system	$48,000
Trenching, electrical, construction	2	$45,000	lump sum	$90,000
Construction Oversight	10	$1,000	day	$10,000
Start-up/optimization	5	$1,000	day	$5,000
Start-up sampling	10	$250	per sample	$2,500
Installation Report	1	$6,000	report	$6,000
TOTAL CAPITOL				**$250,340**
Annual Monitoring (LIF sampling, monitoring well sampling, montlhy adjustments of stinger tubes, vent sampling)	3	$65,000	per year	$195,000
Water recovery/disposal from system	1	$10,000	lump sum	$10,000
Annual Operation (Electrical, maintenance)	3	$5,000	lump sum	$15,000
TOTAL ANNUAL				**$220,000**
System shut-down oversight	10	$1,000	day	$10,000
Well sealing	24	$1,500	per well	$36,000
TOTAL SHUT-DOWN				**$46,000**
20% Contingency				$94,068
Total				**$610,408**

Life Cycle Cost Sheet

Excavation - Source area to water table

Description	Quantity	Price	Unit	Total
Soil trucking and disposal	6,650	$40	per ton	$266,000
Trucking and Backfill	6,650	$20	per ton	$133,000
Excavation Contractor	10	$1,000	per day	$10,000
Seal MW-3	1	$1,500	each	$1,500
Install new MW-3	1	$2,500	each	$2,500
Excavation Oversight	10	$1,500		$15,000
Excavation sample analysis	40	$65	per confirmation sample set (DRO/GRO/BTEX)	$2,600
Reporting	1	$5,000		$5,000
Quarterly sampling/monitoring with monthly LNAPL checks and annual report	3	$25,000	annual follow-up monitoring	$75,000
20% Contingency				$102,120
Total				**$612,720**

Appendix H

Cumulative and Updated Tables/Figures

Tables

Attach all tables from the *Investigation Report Form* and indicate those that have been updated during this reporting period by marking the check box below. **Tables must include all cumulative data.**

Updated	Table Number and Na me
☒	Table 1. Tank Information
☒	Table 2. Results of Soil Headspace Screening
☒	Table 3. Analytical Results of Soil Samples
☐	~~Table 4. Other Contaminants Detected in Soils (Petroleum or Non-petroleum Derived)~~
☐	~~Table 5. Contaminated Surface Soil Results~~
☐	~~Table 6. Water Level Measurements and Depths of Water Samples Collected from Borings~~
☒	Table 7. Analytical Results of Water Samples Collected from Borings
☒	Table 8. Other Contaminants Detected in Water Samples Collected from Borings (Petroleum or Non-petroleum Derived)
☒	Table 9. Monitoring Well Completion Information
☒	Table 10. Water Level Measurements in Wells
☒	Table 11. Analytical Results of Water Samples Collected from Wells
☒	Table 12. Other Contaminants Detected in Water Samples Collected from Wells (Petroleum or Non-petroleum Derived)
☐	~~Table 13. Natural Attenuation Parameters~~
☒	Table 14. Free Product Recovery
☐	~~Table 15. Properties Located within 500 feet of the Release Source~~
☐	~~Table 16. Water Supply Wells Located within 500 feet of the Release Source and Municipal or Industrial Wells within ½ mile~~
☐	~~Table 17. Surface Water Receptor Information~~
☒	Table 18. Utility Receptor Information
☒	Table 19. Vapor Survey Results
☒	Table 20. Results of Soil Gas Sampling for Vapor Intrusion Screening
☐	Table 21. LNAPL Recovery Test

Table 1
Tank Information

Tank #	Tank Material[1]	UST or AST	Capacity (gallons)	Contents (product type)	Year Installed	Tank Status[2]	Tank Condition
001		UST	1,000	Diesel Fuel	Unknown	Removed	Good
002		UST	5,000	Gasoline	Unknown	Removed	Good
003		UST	5,000	Gasoline	Unknown	Removed	Good

[1] "F" for fiberglass or "S" for Steel
[2] Indicate: removed (date), abandoned in place (date), or currently in use.
Add additional rows as needed.
Notes:

Table 2
Results of Soil Headspace Screening

Depth (ft)	Soil Boring ID									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
4										
5	80	6.0			210		170			
6						0.0		150		
8										
9										
11	1000+	5.0	5.0	0.0	310	4.0	160	180		
12									66	450
15							135			
16					400	50		160	32	12
17			5.0	0.0						
18	1000+	68								
20	1000+		7.5	0.0					1000+	1000+
21					200	30	140	130		
26					240	0.5	5.0	250		
29	5.0									

Depth (ft)	Soil Boring ID									
	11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
4	0.5	1.0	5.0	9.5						
5										
6										
8	0.0	0.5	1000+	36						
9			1000+			0.0	0.0	0.0	0.0	
11					390					
12	0.0	0.0	580	240						
15	0.5									
16		0.0	1000+	550	1000+					
17										
18										360
20		9.0	1000+	1000+	1000+	105	136	0.0	480	
21										
26										
29										

Table 2
Results of Soil Headspace Screening

Depth (ft)	Soil Boring ID									
	21	**22**	**23**	**24**	**25**					
4										
5			1999	1999	5.0					
6										
8										
9			1999	1999	5.0					
11										
12										
15			1999	1999	5.4					
16										
17										
18	360									
20		698								

Depth (ft)	Soil Boring ID									
	MW-7	**LGP-1-12**	**MW-8**	**MW-9**	**MW-10**	**MW-11**				
0-2	0									
0-2.5		0.5								
0-5			0.9	1.9	3.2	3.2				
2.5-5		0.5								
5-7	39.4									
5-7.5		1.0								
5-10			2.4	1.2	4.1	5.0				
7.5-10		1.2								
10-12	127									
10-12.5		10.2								
10-15			177.4	3.3	5.9	6.7				
12.5-15		6.4								
12.5-14.5	1035									
15-17.5		9.6								
15-20			894	1511	5.8	5.0				
15-17	1494									
15-17.5										
17-19	1598									
17.5-20		3.6								
20-22.5		1.5								
20-25			124		863					
22.5-25		26.7								
25-27.5		2.1								
27.5-30		1.7								

List instruments used and discuss field methods and procedures in Section 6. Add additional rows as needed, and copy the entire table if more columns are needed. Notes:

Table 3
Analytical Results of Soil Samples[1]

Boring ID	Sampled Depth (ft)	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	GRO	DRO	Lab Type[2]
TH-1	17.5-19.5	4/19/95	<0.05	0.078	<0.05	<0.15		<10*	334	Fix
TH-1	28-30	4/19/95	4.97	52	45.9	322		2140	<10	Fix
TH-2	17.5-19.5	4/19/95	<0.05	0.101	<0.05	0.159		<10	<10	Fix
TH-3	17.5-19.5	4/19/95	<0.05	<0.05	<0.05	<0.15		<10	<10	Fix
TH-4	18.5-20.5	4/19/95	<0.05	0.069	<0.05	<0.15		<10	<10	Fix
TH-6	15-16.5	6/27/95	<0.05	<0.05	<0.05	<0.15		<10	<10	Fix
TH-7	5-6.5	6/27/95	<0.05	<0.145	0.109	<0.15		86.6	155	Fix
TH-7	25-26.5	6/27/95	<0.05	0.089	<0.05	<0.15		<10	<10	Fix
TH-8	5-6.5	6/27/95	326	794	183	955		14700	3470	Fix

[1] Report results in mg/kg. Use less than symbols to show detection limit.
[2] Indicate "mobile" or "fixed" in the lab type column.
Add additional rows as needed.
Notes:

~~Table 4~~
~~Other Contaminants Detected in Soils (Petroleum or Non-petroleum Derived)~~[1]

Boring ID	Sampled Depth (ft)	Date Sampled								Lab Type[2]

[1] Report results in mg/kg. Use less than symbols to show detection limit.
[2] Indicate "mobile" or "fixed" in the lab type column.
Indicate other contaminants (either petroleum or non-petroleum derived) detected in soil collected from borings. Add additional rows as needed, and copy the entire table if more columns are needed.
Notes:

~~**Table 5**~~
~~**Contaminated Surface Soil Results**~~

Sample ID	Headspace 10 ppm or Greater[1] (Y/N)	Petroleum Saturated (Y/N)

[1] As measured with a photoionization detector (PID).
Add additional rows as needed.
Notes:

Table 6
Water Level Measurements and Depths of Water Samples Collected from Borings

	Soil Boring									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Static Water Level Depth[1] (ft)										
Sampled Depth (ft)										
Sampling Method[2]										

[1] Describe the methods used to measure water levels in borings in Section 6.
[2] Refer to Guidance Document 4-05 for acceptable ground water sampling methods.
Notes:

Table 7
Analytical Results of Water Samples Collected from Borings[1]

Boring ID	Date Sampled	Sampled Depth (ft)	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	GRO	DRO	Lab Type[2]
TH-1	4/19/95		1,080	1,520	943	9,000		5,840		Fixed
TH-9	8/01/95	20	129	133	38.5	68.7		3,200	1,500	Fixed
TH-10	8/01/95	20	318	314	49.9	295		15,100		Fixed
TH-11	8/01/95	20	<1.0	<1.0	<1.0	<3.0		<100		Fixed
TH-12	8/01/95	20	1.1	1.9	1.1	3.1		<100		Fixed
TH-13	8/01/95	20	130,000	349,000	162,000	244,000		9,100,000		Fixed
TH-14	8/01/95	20	19,600	37,200	11,200	66,200		1,660,000		Fixed
TH-15	8/01/95	20	10,100	20,500	5,160	23,100		597,000		Fixed
TH-16	8/01/95	20	2,130	5,210	1,230	5,910		135,000		Fixed
TH-17	11/28/95	20	3.6	<0.4	<0.4	<0.5		<100	300	Fixed
TH-18	11/28/95	20	<0.5	<0.4	<0.4	<0.5		<100	<100	Fixed
TH-19	11/28/95	20	1,900	5,470	3,350	25,730		57,900	7,300	Fixed
TH-20	11/28/95	20	1,450	85.6	75.1	494.7		10,900	1,500	Fixed
TH-21	11/28/95	22	328	55.5	377	910		12,900		Fixed
TH-22	11/28/95	22	122	69.9	17.1	99.6		1,100	100	Fixed
TH-23	6/23/97	20-24	1,346	11,900	990	6,590		49,880		Fixed
TH-24	6/23/97	20-24	1,310	2,650	674	4,200		26,930		Fixed
TH-25	6/23/97	20-24	<1.0	2.1	<1.0	<3.0		<100		Fixed
TH-26	6/23/97	20-24	1.0	3.4	<1.0	<3.0		<100		Fixed
TH-27	6/23/97	22-26	2,260	899	774	1,540		13,100		Fixed
TH-28	6/23/97	22-26	4,160	2,520	538	2,880		22,800		Fixed
TH-29	6/23/97	22	11.3	3.3	<1.0	<3.0		180		Fixed
TH-30	6/23/97	22	<1.0	<1.0	<1.0	<3.0		<100		Fixed
TH-31	6/24/97	22-26	88.2	3.1	<1.0	7.1		730		Fixed
TH-32	6/24/97	22-26	2,550	9,080	1,350	7,190		33,000		Fixed
TH-33	6/24/97	22-26	3,340	5,230	1,980	9,320		50,200		Fixed
TH-34	6/24/97	22-26	28.5	39.5	43.2	209		1,380		Fixed
TH-35	6/24/97	20-22	3,540	9,690	1,370	8,380		37,600		Fixed
TH-36	6/24/97	22-26	1,720	298	294	754		8,360		Fixed
TH-37	7/21/97	24-25	313	3.5	2.2	10.8		1,800		Fixed
TH-38	7/21/97	22-26	209	<1.0	1.2	8.8		700		Fixed
TH-39	7/21/97	28-32	147	<1.0	<1.0	<3.0		500		Fixed
TH-40	7/21/97	24-28	42	<1.0	<1.0	1.8		100		Fixed
TH-41	7/21/97	24-28	<1.0	<1.0	<1.0	<3.0		<100		Fixed
TH-42	8/02/97	24-26	<1.0	<1.0	<1.0	<3.0		<100		Fixed
TH-43	7/23/97	21-26	291	<1.0	1.1	5.3		670		Fixed
TH-44	7/23/97	24-26	36	<1.0	<1.0	<3.0		<100		Fixed
TH-45	7/23/97	26-28	4.9	<1.0	<1.0	<3.0		<100		Fixed
GP-1	1/21/2010	24-29	895	613	508	2,200	<25	10,200	3.6	Fixed
GP-2	1/21/2010	25-30	10.4	3.5	<1.0	8.6	5.7	1,240	0.42	Fixed
Trip Blank	1/21/2010		<1.0	<1.0	<1.0	<1.0	<5.0	<100		Fixed
Equip. Blank										
Lab Blank										
HRL[3]			10	200	50	300		200		

[1] Report results in µg/L. Use less than symbols to show detection limit.
[2] Indicate "mobile" or "fixed" in the lab type column.
[3] See http://www.health.state.mn.us/divs/eh/groundwater/hrltable.html for list of current HRLs.
Add additional rows as needed.
Notes:

Table 8
Other Contaminants Detected in Water Samples
Collected from Borings (Petroleum or Non-petroleum Derived)[1]

Boring ID	Date Sampled	Sampled Depth (ft)	Acetone	Methylethyl ketone	1,2-di-chloroethane	Methyl isobutylethane	1,2-Dibromoethane	Chlorobenzene	Isopropylbenzene	N-propylbenzene	1,3,5-TMB	Tert-Butylbenzene	1,2,4-TMB	Sec-Butylbenzene	p-Isopropyltoluene	n-butylbenzene	Napthalene	Lab Type[2]
TH-17	20	11/20/1995	4.5	<2.8	<0.3	<0.7	<0.8	<0.4	<0.7	<0.8	<0.2	<0.6	<0.7	<0.5	<0.4	<0.3	<0.7	
TH-18	20	11/20/1995	<0.3	<2.8	<0.3	<0.7	<0.8	<0.4	<0.7	<0.8	<0.2	<0.6	<0.7	<0.5	<0.4	<0.3	<0.7	
TH-19	20	11/20/1995	820	52,200	<0.3	<0.7	<0.8	<0.4	7,780	3,010	3,680	1,430	10,200	2,110	968	5,330	2,200	
TH-20	20	11/21/1995	52.3	529	41.9	12	15.9	<0.4	19.4	2.2	70.1	<0.6	375	<0.5	<0.4	28.7	172	
TH-21	22	11/21/1995	56.8	1630	24	<0.7	<0.8	112	302	384	491	120	1500	224	77.5	505	361	
TH-22	22	11/21/1995	29	63	<0.3	<0.7	<0.8	<0.4	4.1	0.9	4.6	<0.6	20.7	<0.5	<0.4	4.8	5.8	
GP-1											113		413					
GP-2	25-30	1/21/2010											1.1					
Trip Blank																		
Equip. Blank																		
Lab Blank																		
HRL[3]																		

[1] Report results in µg/L. Use less than symbols to show detection limit.
[2] Indicate "mobile" or "fixed" in the lab type column.
[3] See http://www.health.state.mn.us/divs/eh/groundwater/hrltable.html for list of current HRLs.
Indicate other contaminants (either petroleum or non-petroleum derived) detected in water samples collected from soil borings and temporary wells. Add additional rows as needed, and copy the entire table if more columns are needed.
Notes:

Table 9 (Previous Data)
Monitoring Well Completion Information[1]

Well Number	MDH Unique Well Number	Date Installed	Surface Elevation	Top of Casing Elevation	Bottom of Well Elevation	Screen Interval (Elev. - Elev.)	Total Well Depth from Surface (ft)
MW-1	554377	6/15/1995	963.07	963.10	939.07	939.07–949.07	24
MW-2	554378	6/15/1995	963.67	963.37	939.67	939.67–949.67	24
MW-3	554379	6/15/1995	961.97	963.72	934.97	934.97–944.97	27
MW-4	617207	9/01/1998	964.87	964.62	935.87	935.87–945.87	29
MW-5	617205	9/02/1998	963.84	963.68	934.84	934.84–944.84	29
MW-5A	617206	9/02/1998	963.81	963.62	919.81	919.81–929.81	44
MW-6	617203	9/02/1998	963.94	963.93	934.94	934.94–944.94	29
MW-6A	617204	9/02/1998	963.76	963.73	922.76	922.76–932.76	41
MW-7	731591	9/19/2005	963.27	963.29	939.29	939.29–949.29	24

[1] Include well construction diagrams and MDH well logs in Section 6.
Add additional rows as needed.
Notes: (location and elevation of benchmark)

Table 9 (January 2013 Resurveyed Data)
Monitoring Well Completion Information[1]

Well Number	MDH Unique Well Number	Date Installed	Surface Elevation	Top of Casing Elevation	Bottom of Well Elevation	Screen Interval (Elev. - Elev.)	Total Well Depth from Surface (ft)
MW-1	554377	6/15/1995	962.92	963.00	938.92	938.92–948.92	24
MW-2	554378	6/15/1995	Unknown	Unknown	Unknown	Unknown	24
MW-3	554379	6/15/1995	962.18	961.59	935.18	935.18–945.18	27
MW-4	617207	9/01/1998	Unknown	Unknown	Unknown	Unknown	29
MW-5	617205	9/02/1998	Unknown	Unknown	Unknown	Unknown	29
MW-5A	617206	9/02/1998	Unknown	Unknown	Unknown	Unknown	44
MW-6	617203	9/02/1998	962.61	962.41	933.61	933.61-943.61	29
MW-6A	617204	9/02/1998	962.65	962.46	921.65	921.65-931.65	41
MW-7	731591	9/19/2005	962.01	961.91	938.01	938.01-948.01	24
MW-8	792988	12/11/2012	962.54	962.60	936.54	936.54-951.54	26
MW-9	792989	12/12/2012	961.89	961.85	935.89	935.89-950.89	26
MW-10	792990	12/13/2012	963.94	963.94	935.94	935.94-945.94	28
MW-11	792991	12/11/2012	962.13	964.46	937.13	937.13-947.13	25

[1] Include well construction diagrams and MDH well logs in Section 6.
Add additional rows as needed.
Notes: (location and elevation of benchmark)

Table 10
Water Level Measurements in Wells[1]

Well Number	Date Sampled	Depth to Water from Top of Riser	Product Thickness	Depth to Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)
MW-1	1/11/2002	NR	NR	NR	NR	NR
	6/24/2002	NR	ND	NR	NR	N
	9/13/2002	18.21	ND	18.18	944.89	N
	12/26/2002	17.73	ND	17.70	945.37	N
	4/14/2003	18.18	ND	18.15	944.92	N
	7/7/2003	17.74	ND	17.71	945.36	N
	10/10/2003	17.42	ND	17.39	945.68	N
	2/6/2004	18.20	ND	18.17	944.9	N
	3/18/2004	18.48	ND	18.45	944.62	N
	6/18/2004	NR	ND	NR	NR	NR
	9/7/2004	18.17	ND	18.14	944.93	N
	9/14/2004	NR	ND	NR	NR	NR
	12/20/2004	18.32	ND	18.29	944.78	N
	2/23/2005	NR	ND	NR	NR	NR
	3/10/2005	18.51	ND	18.48	944.59	N
	4/11/2005	18.79	ND	18.76	944.31	N
	6/9/2005	18.93	ND	18.90	944.17	N
	8/4/2005	18.77	ND	18.74	944.33	N
	11/1/2005	17.16	ND	17.13	945.94	N
	3/1/2006	18.13	ND	18.1	944.97	N
	7/13/2006	Dry	ND	NR	NR	N
	10/4/2006	18.67	ND	18.64	944.43	N
	3/9/2007	NS Covered w snow pile	NA	NR	NR	NA
	7/24/2007	19.28	ND	19.25	943.82	N
	1/20/2010	19.95	ND	19.92	943.15	N
	1/12/2011	18.96	0.15	18.93	944.14	N
	3/21/2011	19.16	ND	19.13	943.94	N
	6/7/2011	18.59	ND	18.56	944.51	N
	10/4/2011	17.03	ND	17.00	946.07	N
	01/10/2013	18.21	ND	18.13	944.79	N
	05/3/2013	18.87	ND	18.79	944.13	N
	2/3/14	**19.97**	**ND**	**19.89**	**943.03**	**N**
	4/03/14	**19.19**	**ND**	**19.11**	**943.81**	**N**
	5/02/14	**19.08**	**ND**	**19.00**	**943.92**	**N**
	8/01/14	**18.34**	**ND**	**18.26**	**944.66**	**N**
	11/7/14	**16.61**	**ND**	**16.53**	**946.39**	**N**
	02/09/15	**17.25**	**ND**	**17.17**	**945.75**	**N**

Table 10
Water Level Measurements in Wells[1]

Well Number	Date Sampled	Depth to Water from Top of Riser	Product Thickness	Depth to Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)
	05/08/15	**17.7**	**ND**	**17.62**	**945.3**	**N**
	08/13/15	**17.61**	**ND**	**17.53**	**945.39**	**N**
	11/03/15	**18.26**	**ND**	**18.18**	**944.74**	**N**
	2/02/16	**17.63**	**ND**	**17.55**	**945.37**	**N**
MW-3	10/10/2003	18.11	ND	16.36	945.61	Y
	2/6/2004	20.19	1.3’	18.44	943.53	N
	3/18/2004	20.21	1.3	18.46	943.51	N
	6/18/2004	19.65	0.56	17.90	944.07	N
	9/7/2004	18.97	ND	17.22	944.75	N
	9/14/2004	18.82	NR	17.07	944.90	N
	12/20/2004	19.13	0.05	17.38	944.59	N
	2/23/2005	10.94	0.77	9.19	952.78	N
	3/10/2005	19.61	0.47	17.86	944.11	Y
	4/11/2005	20.13	0.86	18.38	943.59	N
	6/9/2005	20.46	1.03	18.71	943.26	N
	7/12/2005	20.22	0.82	18.47	943.50	N
	8/4/2005	20.15	0.79	18.4	943.57	N
	9/28/2005	N/R	N/R	NR	NR	
	10/5/2005	16.76	0.3	15.01	946.96	Y
	11/1/2005	17.44	0	15.69	946.28	Y
	3/1/2006	17.65	ND	15.9	946.07	Y
	7/13/2006	18.34	.52’	16.59	945.38	Y
	10/4/2006	18.92	ND	17.17	944.8	N
	3/9/2007	19.98	5.5”	18.23	943.74	N
	7/24/2007	NA	0.8”	NR	NR	N
	1/20/2010	TOC Broken	4”	NR	NR	N
	3/21/2011	17.89	ND	16.14	945.83	Y
	6/7/2011	17.29	ND	15.54	946.43	Y
	10/4/2011	15.77	ND	14.02	947.95	Y
	01/10/2013	NA	7”	NA	NA	NA
	05/3/2013	NA	5”	NA	NA	NA
	2/3/2014	**18.04**	**0.52’ (6.24 “)**	**18.63**	**943.55**	**N**
	3/6/2014	**18.12**	**0.53’**	**18.71**	**943.47**	**N**
	4/3/2014	**18.22**	**0.56’**	**18.81**	**943.37**	**N**
	5/2/2014	**17.69**	**0.04**	**18.28**	**943.86**	**N**
	6/4/2014	**17.00**	**ND**	**17.59**	**944.59**	**N**
	7/04/14	**16.54**	**ND**	**17.13**	**945.05**	**N**
	8/01/14	**16.07**	**0.01**	**16.66**	**945.52**	**Y**

Table 10
Water Level Measurements in Wells[1]

Well Number	Date Sampled	Depth to Water from Top of Riser	Product Thickness	Depth to Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)
	9/02/14	**15.76**	**0.01**	**16.35**	**945.84**	**Y**
	10/03/14	**15.48**	**ND**	**16.07**	**946.11**	**Y**
	11/07/14	**15.31**	**Trace**	**15.9**	**946.28**	**Y**
	12/05/14	**15.52**	**Trace**	**16.11**	**946.07**	**Y**
	01/02/15	**15.59**	**trace**	**16.18**	**946**	**Y**
	02/09/15	**15.97**	**0.01**	**16.56**	**945.62**	**Y**
	03/06/15	**16.06**	**trace**	**16.65**	**945.53**	**Y**
	04/02/15	**16.24**	**ND**	**16.83**	**945.35**	**Y**
	05/08/15	**16.43**	**ND**	**17.02**	**945.16**	**N**
	06/05/15	**16.55**	**ND**	**17.14**	**945.04**	**N**
	07/01/15	**16.53**	**ND**	**17.12**	**945.06**	**N**
	08/13/15	**16.16**	**ND**	**16.75**	**945.43**	**Y**
	09/03/15	**16.01**	**ND**	**16.6**	**945.58**	**Y**
	10/02/15	**16.03**	**ND**	**16.62**	**945.56**	**Y**
	11/02/15	**14.90**	**ND**	**15.49**	**946.69**	**Y**
	12/04/15	**16.13**	**ND**	**16.72**	**945.46**	**Y**
	1/11/16	**16.19**	**ND**	**16.78**	**945.40**	**Y**
	2/02/16	**16.29**	**ND**	**16.88**	**945.30**	**Y**
MW-6	1/11/2002	20.21	ND	20.22	943.72	N
	6/24/2002	NR	ND	NR	NR	N
	9/13/2002	19.57	ND	19.58	944.36	N
	12/26/2002	18.58	ND	18.59	945.35	Y
	4/14/2003	18.85	ND	18.86	945.08	Y
	7/7/2003	18.65	ND	18.66	945.28	Y
	10/10/2003	18.21	ND	18.22	945.72	Y
	2/6/2004	19.41	ND	19.42	944.52	N
	3/18/2004	19.14	ND	19.15	944.79	N
	6/18/2004	NR	ND	NR	NR	NR
	9/7/2004	19.02	ND	19.03	944.91	N
	9/14/2004	NR	ND	NR	NR	N
	12/20/2004	19.1	ND	19.11	944.83	N
	2/23/2005	NR	ND	NR	NR	NR
	3/10/2005	19.13	ND	19.14	944.80	N
	4/11/2005	20.59	ND	20.60	943.34	N
	6/9/2005	19.65	ND	19.66	944.28	N
	8/4/2005	19.71	ND	19.72	944.22	N
	11/1/2005	19.22	ND	19.23	944.71	N
	3/1/2006	19.74	ND	19.75	944.19	N
	7/13/2006	19.51	ND	19.52	944.42	N

Table 10
Water Level Measurements in Wells[1]

Well Number	Date Sampled	Depth to Water from Top of Riser	Product Thickness	Depth to Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)
	10/4/2006	19.59	ND	19.60	944.34	N
	3/9/2007	19.87	ND	19.88	944.06	N
	7/24/2007	20.12	ND	20.13	943.81	N
	1/20/2010	20.67	ND	20.68	943.26	N
	1/12/2011	19.73	ND	19.74	944.2	N
	3/21/2011	19.83	ND	19.84	944.1	N
	6/7/2011	19.52	ND	19.53	944.41	N
	10/4/2011	17.98	ND	17.99	945.95	Y
	01/10/2013	18.86	ND	19.06	943.55	N
	05/3/2013	19.50	ND	19.70	942.91	N
	2/3/14	**19.61**	**ND**	**19.81**	**942.8**	**N**
	5/02/14	**19.83**	**ND**	**20.03**	**942.58**	**N**
	08/01/14	**18.39**	**ND**	**18.59**	**944.02**	**Y**
	11/07/14	**17.42**	**ND**	**17.62**	**944.99**	**Y**
	02/09/14	**17.92**	**ND**	**18.12**	**944.49**	**Y**
	05/08/15	**18.35**	**ND**	**18.55**	**944.06**	**Y**
	08/13/15	**18.28**	**ND**	**18.48**	**944.13**	**Y**
	11/03/15	**16.96**	**ND**	**17.16**	**945.45**	**Y**
	2/02/16	**18.28**	**ND**	**18.48**	**944.13**	**Y**
MW-6A	1/11/2002	20.13	ND	20.16	943.6	Y
	6/24/2002	NR	ND	NR	NR	Y
	6/24/2002	NR	ND	NR	NR	Y
	9/13/2002	19.48	ND	19.51	944.25	Y
	12/26/2002	18.61	ND	18.64	945.12	Y
	4/14/2003	18.96	ND	18.99	944.77	Y
	7/7/2003	18.79	ND	18.82	944.94	Y
	10/10/2003	20.19	ND	20.22	943.54	Y
	2/6/2004	19.46	ND	19.49	944.27	Y
	3/18/2004	19.19	ND	19.22	944.54	Y
	6/18/2004	NR	ND	NR	NR	NR
	9/7/2004	19.83	ND	19.86	943.9	Y
	9/14/2004	NR	ND	NR	NR	NR
	12/20/2004	19.18	ND	19.21	944.55	Y
	2/23/2005	NR	ND	NR	NR	NR
	3/10/2005	19.21	ND	19.24	944.52	Y
	4/11/2005	19.44	ND	19.47	944.29	Y
	6/9/2005	20.06	ND	20.09	943.67	Y
	8/4/2005	21.11	ND	21.14	942.62	Y
	11/1/2005	21.51	ND	21.54	942.22	Y

Table 10
Water Level Measurements in Wells[1]

Well Number	Date Sampled	Depth to Water from Top of Riser	Product Thickness	Depth to Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)
	3/1/2006	19.13	ND	19.16	944.6	Y
	7/13/2006	21.19	ND	21.22	942.54	Y
	10/4/2006	20.05	ND	20.08	943.68	Y
	3/9/2007	20.31	ND	20.34	943.42	Y
	7/24/2007	20.16	ND	20.19	943.57	Y
	1/20/2010	20.70	ND	20.73	943.03	Y
	1/12/2011	19.78	ND	19.81	943.95	Y
	3/21/2011	19.87	ND	19.9	943.86	Y
	6/7/2011	19.56	ND	19.59	944.17	Y
	10/4/2011	18.03	ND	18.06	945.7	Y
	01/10/2013	18.53	ND	18.72	943.93	Y
	05/3/2013	19.55	ND	19.74	942.91	Y
	08/01/2014	**18.45**	**ND**	**18.64**	**944.01**	**Y**
	05/08/15	**18.41**	**ND**	**18.6**	**944.05**	**Y**
	08/13/15	**18.33**	**ND**	**18.52**	**944.13**	**Y**
	11/03/15	**17.03**	**ND**	**17.22**	**945.43**	**Y**
	2/02/16	**18.33**	**ND**	**18.52**	**944.13**	**Y**
MW-7	9/16/2005	17.00	ND	16.98	946.29	N
	11/1/2005	17.72	ND	17.70	945.57	N
	3/1/2006	17.81	ND	17.79	945.48	N
	7/13/2006	18.14	ND	18.12	945.15	N
	10/4/2006	18.20	ND	18.18	945.09	N
	3/9/2007	18.60	ND	18.58	944.69	N
	7/24/2007	18.83	ND	18.81	944.46	N
	1/20/2010	20.45	16”	20.43	942.84	N
	1/21/2011	18.50	0.15	18.48	944.79	N
	3/21/2011	18.8	0.15	18.78	944.49	N
	6/7/2011	18.13	ND	18.11	945.16	N
	10/4/2011	16.53	ND	16.51	946.76	N
	01/10/2013	17.63	0.06’	17.73	944.28	N
	05/3/2013	18.31	0.06’	18.41	943.50	N
	2/3/14	**18.30**	**0.02’**	**18.40**	**943.61**	**N**
	3/6/2014	**18.35**	**0.03’**	**18.45**	**943.56**	**N**
	4/3/14	**18.54**	**0.03**	**18.64**	**943.37**	**N**
	5/2/14	**18.47**	**0.02**	**18.57**	**943.44**	**N**
	6/4/14	**17.87**	**ND**	**17.97**	**944.04**	**N**
	7/4/14	**17.40**	**ND**	**17.50**	**944.51**	**N**
	8/1/14	**16.895**	**0.005**	**17.00**	**945.01**	**N**
	9/2/14	**16.52**	**.01**	**16.62**	**945.40**	**N**

Table 10
Water Level Measurements in Wells[1]

Well Number	Date Sampled	Depth to Water from Top of Riser	Product Thickness	Depth to Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)
	10/03/13	**16.24**	**ND**	**16.34**	**945.67**	**N**
	11/07/14	**16.05**	**Trace**	**16.15**	**945.86**	**N**
	12/05/14	**16.21**	**Trace**	**16.31**	**945.7**	**N**
	01/02/15	**16.56**	**Trace**	**16.66**	**945.35**	**N**
	02/09/15	**16.65**	**0.015**	**16.75**	**945.21**	**N**
	03/06/15	**16.72**	**0.01**	**16.82**	**945.19**	**N**
	04/02/15	**16.89**	**ND**	**16.99**	**945.02**	**N**
	05/08/15	**17.1**	**ND**	**17.2**	**944.81**	**N**
	06/05/15	**17.23**	**ND**	**17.33**	**944.68**	**N**
	07/01/15	**17.22**	**ND**	**17.32**	**944.69**	**N**
	08/13/15	**16.9**	**ND**	**17.0**	**945.01**	**N**
	09/03/15	**16.75**	**ND**	**16.85**	**945.16**	**N**
	10/02/15	**16.75**	**ND**	**16.85**	**945.16**	**N**
	11/03/15	**15.66**	**ND**	**15.76**	**946.25**	**N**
	12/04/15	**16.81**	**ND**	**16.91**	**945.10**	**N**
	1/11/16	**16.88**	**ND**	**16.98**	**945.03**	**N**
	2/02/16	**16.98**	**ND**	**17.08**	**944.93**	**N**
MW-8	01/10/2013	18.44	ND	18.38	944.16	N
	05/3/2013	19.14	1/16”	19.08	943.46	N
	2/3/2014	**Buried by snow bank, soil pile and construction equipment**				
	3/6/2014	**Buried by snow bank, soil pile and construction equipment**				
	4/3/2014	**Buried by snow bank, soil pile and construction equipment**				
	5/02/14	**19.33**	**0.04**	**19.27**	**943.27**	**N**
	6/04/14	**18.76**	**0.02**	**18.7**	**943.84**	**N**
	7/04/14	**18.27**	**ND**	**18.21**	**944.33**	**N**
	08/01/14	**17.77**	**0.01**	**17.71**	**944.83**	**N**
	9/02/14	**17.41**	**0.01**	**17.35**	**945.19**	**N**
	10/03/14	**17.11**	**ND**	**17.05**	**945.49**	**N**
	11/07/14	**16.9**	**Trace**	**16.84**	**945.70**	**N**
	12/05/14	**17.06**	**Trace**	**17**	**945.54**	**N**
	01/02/15	**17.29**	**Trace**	**17.23**	**945.31**	**N**
	02/09/15	**17.49**	**0.01**	**17.43**	**945.11**	**N**
	03/06/15	**17.56**	**0.01**	**17.5**	**945.04**	**N**
	04/02/15	**17.03**	**ND**	**16.97**	**945.57**	**N**
	05/08/15	**17.95**	**ND**	**17.89**	**944.65**	**N**
	06/05/15	**18.06**	**ND**	**18.00**	**944.54**	**N**
	07/01/15	**18.06**	**ND**	**18.00**	**944.54**	**N**
	08/13/15	**17.75**	**ND**	**17.69**	**944.85**	**N**
	09/03/15	**17.6**	**ND**	**17.54**	**945**	**N**

Table 10
Water Level Measurements in Wells[1]

Well Number	Date Sampled	Depth to Water from Top of Riser	Product Thickness	Depth to Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)
	10/02/15	**17.62**	**ND**	**17.56**	**944.98**	**N**
	11/03/15	**16.5**	**ND**	**16.44**	**946.1**	**N**
	12/04/15	**17.66**	**ND**	**17.60**	**944.94**	**N**
	1/11/16	**17.73**	**ND**	**17.67**	**944.87**	**N**
	2/02/16	**17.84**	**ND**	**17.78**	**944.76**	**N**
MW-9	01/10/2013	17.79	ND	17.83	944.06	N
	05/3/2013	18.44	ND	18.48	943.41	N
	2/3/2014	**18.45**	**ND**	**18.49**	**943.40**	**N**
	3/6/2014	**18.46**	**ND**	**18.5**	**943.41**	**N**
	4/03/14	**18.91**	**ND**	**18.95**	**942.94**	**N**
	5/02/14	**18.65**	**ND**	**18.69**	**943.20**	**N**
	6/04/14	**18.13**	**ND**	**18.17**	**943.72**	**N**
	7/04/14	**17.66**	**ND**	**17.7**	**944.19**	**N**
	8/01/14	**17.19**	**ND**	**17.23**	**944.66**	**N**
	9/02/14	**17.56**	**0.01**	**17.6**	**944.29**	**N**
	10/03/14	**16.5**	**ND**	**16.54**	**945.35**	**N**
	11/07/14	**16.29**	**trace**	**16.33**	**945.56**	**N**
	12/05/14	**16.42**	**Trace**	**16.46**	**945.43**	**N**
	01/02/15	**16.53**	**Trace**	**16.57**	**945.32**	**N**
	02/09/15	**16.84**	**0.01**	**16.88**	**945.01**	**N**
	03/06/15	**16.9**	**16.899**	**16.94**	**944.95**	**N**
	04/02/15	**17.09**	**ND**	**17.13**	**944.76**	**N**
	05/08/15	**17.29**	**ND**	**17.33**	**944.56**	**N**
	06/05/15	**17.42**	**ND**	**17.46**	**944.43**	**N**
	07/01/15	**17.42**	**ND**	**17.46**	**944.43**	**N**
	08/13/15	**17.14**	**ND**	**17.18**	**944.71**	**N**
	09/03/15	**16.99**	**ND**	**17.03**	**944.86**	**N**
	10/02/15	**16.99**	**ND**	**17.03**	**944.86**	**N**
	11/03/15	**15.85**	**ND**	**15.89**	**946**	**N**
	12/04/15	**17.05**	**ND**	**17.09**	**944.8**	**N**
	1/11/16	**17.11**	**ND**	**17.15**	**944.74**	**N**
	2/02/16	**17.21**	**ND**	**17.25**	**944.64**	**N**
MW-10	01/10/2013	21.18	ND	21.18	942.76	N
	05/3/2013	21.81	ND	21.81	942.13	N
	2/3/2014	**22.92**	**ND**	**22.92**	**941.02**	**N**
	5/2/2014	**22.12**	**ND**	**22.12**	**941.82**	**N**
	08/01/2014	**21.65**	**ND**	**21.65**	**942.29**	**N**
	11/07/14	**19.73**	**ND**	**19.73**	**944.21**	**N**
	02/09/15	**20.18**	**ND**	**20.18**	**943.76**	**N**

Table 10
Water Level Measurements in Wells[1]

Well Number	Date Sampled	Depth to Water from Top of Riser	Product Thickness	Depth to Water Below Grade	Relative Groundwater Elevation	Water Level Above Screen (Y/N)
	05/08/15	**20.64**	**ND**	**20.64**	**943.3**	**N**
	08/13/15	**20.65**	**ND**	**20.65**	**943.29**	**N**
	11/03/15	**19.31**	**ND**	**19.31**	**944.63**	**N**
	02/02/16	**20.59**	**ND**	**20.59**	**943.35**	**N**
MW-11	01/10/2013	19.87	ND	17.54	944.59	N
	05/3/2013	20.54	ND	18.21	943.92	N
	05/2/2014	**20.64**	**ND**	**18.31**	**943.82**	**N**
	08/01/2014	**18.87**	**ND**	**16.54**	**945.59**	**N**
	11/07/14	**18.13**	**ND**	**15.8**	**946.33**	**N**
	05/08/15	**19.31**	**ND**	**16.98**	**945.15**	**N**
	11/03/15	**17.83**	**ND**	**15.5**	**946.63**	**N**
	02/02/16	**19.14**	**ND**	**16.81**	**945.32**	**N**

[1] Describe the methods used to measure water levels in Section 6.
Add additional rows as needed.
Notes:

Table 11
Analytical Results of Water Samples Collected from Wells[1]

Well Number	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	GRO	DRO	Lab Type[2]
MW-1	1/11/2002	NS	NS	NS	NS	NS	NS	NS	Fixed
	6/24/2002	<1.0	<1.0	2.6	26/15	<1.0	200	NS	Fixed
	9/13/2002	<1.0	5.6	14	240	NA	610 H	NS	Fixed
	12/26/2002	<1.0	<1.0	<1.0	67	NA	110	NS	Fixed
	4/14/2003	<1.0	2.1	4.1	131	<1.0	1,900	NS	Fixed
	7/7/2003	<1.0	17	8	2,100	<1.0	4,300	NS	Fixed
	10/10/2003	<1.0	10	19	580	<1.0	2,500	NS	Fixed
	2/6/2004	ND	2.1	9.1	192	ND	240	NS	Fixed
	3/18/2004	ND	14	63	1120	ND	2,300	NS	Fixed
	9/7/2004	ND	32	220	2400	ND	6,800	NS	Fixed
	12/20/2004	ND	51.9	300	4660	ND	8,940	NS	Fixed
	3/10/2005	ND	ND	72.8	2940	ND	11,500	NS	Fixed
	6/9/2005	ND	ND	16.4	905	ND	2,220	NS	Fixed
	8/4/2005	3.8	ND	94	2100	ND	4,300	NS	Fixed
	11/9/2005	<0.50	ND	ND	100	ND	9,400	NS	Fixed
	3/1/2006	<1.0	<5.0	110	3,900	NS	10,000	NS	Fixed
	7/13/2006	Well dry	NS	NS	NS	NS	NS	NS	Fixed
	10/4/2006	<0.05	<5.0	2.7	100	<1.0	190	680	Fixed
	3/9/2007	NS	NS	NS	NS	NS	NS	NS	Fixed
	7/24/2007	<0.5	<0.5	0.55	1.93	<1.0	<100	NS	Fixed
	1/20/2010	<1.0	<1.0	<1.0	<3.0	<5.0	<100	180	Fixed
	1/12/2011	<1.0	<1.0	<1.0	23.4	<5.0	<100	2600	Fixed
	3/23/2011	<1.0	<1.0	<1.0	4.7	<5.0	<100	1610	Fixed
	6/8/2011	<1.0	<1.0	1.5	59.2	<5.0	218	2230	Fixed
	10/4/2011	<1.0	<1.0	8.6	272	<5.0	838	1960	Fixed
	01/10/2013	<1.0	<1.0	55.2	1,270	<5.0	3,390	1,450	Fixed
	05/3/2013	<1.0	<1.0	28.9	573	<5.0	2,050	831	Fixed
	2/3/2014	**2.2**	**<1.0**	**20.8**	**434**	**NS**	**1,430**	**1,300**	**Fixed**
	5/2/2014	**<1.0**	**<1.0**	**1.4**	**13.8**	**NS**	**<100**	**210**	**fixed**
	08/01/2014	**<1.0**	**<1.0**	**14.8**	**240**	**NS**	**805**	**1600**	**fixed**
	11/07/2014	**<1.0**	**<1.0**	**12.5**	**322**	**NS**	**966**	**1900**	**fixed**
	02/09/2015	**<1.0**	**<1.0**	**15.8**	**541**	**NA***	**1410**	**820**	**fixed**
	05/08/2015	**<1.0**	**<1.0**	**16.6**	**595**	**NA***	**1530**	**1600**	**fixed**
	08/13/2015	**<1.0**	**<1.0**	**11.8**	**409**	**NA***	**1140**	**1500**	**fixed**

Table 11
Analytical Results of Water Samples Collected from Wells[1]

Well Number	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	GRO	DRO	Lab Type[2]
	11/03/2015	**<1.0**	**<2.5**	**27.2**	**920**	**NA***	**2780**	**2100**	**fixed**
	2/02/2016	**<2**	**<2**	**15.6**	**666**	**NA***	**1960**	**1000**	**fixed**
MW-3	3/1/2006	1,600	<5,000	<1,000	5,100	NS	260,000	NA	Fixed
	3/23/2011	159	209	46.9	777	ND	8,320	8270	Fixed
	6/8/2011	493	521	71.8	2,900	<50	15,600	12800	Fixed
	10/5/2011	2,420	1780	156	6,800	<50	22,600	7630	Fixed
	01/10/2013	NS	NS	NS	NS	NS	NS	NS	Fixed
	05/3/2013	NS	NS	NS	NS	NS	NS	NS	Fixed
MW-3	**2/3/2014**	**NS**	**Product**						
	5/2/2014	**NS**	**Product**						
	08/01/2014	**NS**	**Product**						
	11/07/2014	**NS**	**Product**						
	02/09/2015	**NS**	**Product**						
	05/08/2015	**1860**	**1320**	**42.1**	**4590**	**NA***	**17300**	**12400**	**fixed**
	08/13/2015	**2210**	**1650**	**115**	**5460**	**NA***	**21700**	**16400**	**fixed**
	11/03/2015	**1560**	**1370**	**<50**	**4400**	**NA***	**16300**	**7300**	**fixed**
	2/02/2016	**2280**	**1430**	**163**	**4490**	**NA***	**19700**	**15800**	**fixed**
MW-6	1/11/2002	3,600	3,100	680	1,200/490	<1.0	19,000	NS	Fixed
	6/24/2002	5,800	5,800	1,200	3,100/1,100	<50	27,000	NS	Fixed
	9/13/2002	1,600	1,100	360	1,100	NS	8,400 H	NS	Fixed
	12/26/2002	2,800	750	3,200	2,800	NS	16,000	NS	Fixed
	4/14/2003	3,500	2,600	830	2,750	<20	18,000	NS	Fixed
	7/7/2003	2,300	2,200	660	1,940	<50	16,000	NS	Fixed
	10/10/2003	1,500	1,600	450	1,400	<50	10,000	NS	Fixed
	2/6/2004	2700	2,200	1,000	2,540	ND	17,000	NS	Fixed
	3/18/2004	3,200	2,600	830	2,180	ND	17,000	NS	Fixed
	9/7/2004	3,600	2,800	1,200	4,130	ND	21,000	NS	Fixed
	12/20/2004	3,110	6,110	1,470	5,040	ND	25,200	NS	Fixed
	3/10/2005	4,030	7,650	1,610	6,340	ND	28,200	NS	Fixed
	6/9/2005	4,500	5,800	1,570	5,310	ND	25,800	NS	Fixed
	8/4/2005	4,900	2,400	950	2,870	420	18,000	NS	Fixed
	11/9/2005	3,700	4,400	970	100	ND	27,000	NS	Fixed
	3/1/2006	2,500	1,300	<100	3,500	NS	22,000	NS	Fixed
	7/13/2006	2,500	<500	<50	1,100	<100	<10,000	5,100	Fixed
	10/4/2006	3,500	2,100	1,100	2,260	350	18,000	4,300	Fixed
	3/9/2007	4,000	2,700	350	3,540	780	19,000	5,100	Fixed
	7/24/2007	740	480	72	730	<10	5,200	NS	Fixed

Table 11
Analytical Results of Water Samples Collected from Wells[1]

Well Number	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	GRO	DRO	Lab Type[2]
MW-6	1/20/2010	3,010	1,430	578	1,510	<50	13,700	4,600	Fixed
	1/12/2011	2,200	2,280	725	2,690	<50	14,300	2,670	Fixed
	3/23/2011	2,410	1,670	490	1,320	13.6	13,600	3,850	Fixed
	6/8/2011	1,890	484	272	748	<50	7,060	3,230	Fixed
	10/4/2011	2,810	3,500	913	4,110	<50	18,100	4,250	Fixed
	01/10/2013	2280	3370	1090	4290	<50	16,000	3,750	Fixed
	05/3/2013	2660	3620	1200	4890	<50	26,000	4,350	Fixed
	2/3/2014	**2,480**	**1,710**	**1,260**	**4,170**	**NS**	**20,700**	**7,200**	**Fixed**
	05/02/2014	**<1.0**	**<1.0**	**1.4**	**13.8**	**NS**	**<100**	**210**	**fixed**
	08/01/2014	**3620**	**3290**	**1640**	**5760**	**NS**	**23800**	**5900**	**fixed**
	11/07/2014	**2800**	**2540**	**1150**	**4870**	**NS**	**20800**	**10400**	**fixed**
	02/09/2015	**2860**	**2320**	**1040**	**4390**	**NA***	**20400**	**5100**	**fixed**
	05/08/2015	**2500**	**2480**	**953**	**4250**	**NA***	**15400**	**5700**	**fixed**
	08/13/2015	**2420**	**2750**	**968**	**3920**	**NA***	**18300**	**3600**	**fixed**
	11/03/2015	**2060**	**1880**	**724**	**3120**	**NA***	**14200**	**4700**	**fixed**
DUP-1 (MW-6)	**11/03/2015**	**2150**	**2000**	**865**	**3820**	**NA***	**16200**	**4600**	**fixed**
	2/02/2016	**1910**	**1930**	**874**	**3710**	**NA***	**18600**	**5200**	**fixed**
MW-6A	1/11/2002	<1.0	<1.0	<1.0	<2.0/<1.0	3.4	<100	NS	Fixed
	6/24/2002	<1.0	<1.0	<1.0	<2.0/<1.0	<1.0	<100	NS	Fixed
	9/13/2002	<1.0	<1.0	<1.0	<1.0 total	<1.0	<100	NS	Fixed
	12/26/2002	<1.0	<1.0	<1.0	<1.0 total	<1.0	<100	NS	Fixed
	4/14/2003	<1.0	<1.0	<1.0	<2.0/<1.0	<1.0	<60	NS	Fixed
	7/7/2003	<1.0	<1.0	<1.0	<2.0/<1.0	<1.0	<60	NS	Fixed
	10/10/2003	<1.0	<1.0	<1.0	<2.0/<1.0	<1.0	<60	NS	Fixed
	2/6/2004	ND	ND	ND	ND	ND	ND	NS	Fixed
	3/18/2004	<0.5	<1.0	<1.0	<0.50/<0.50	<1.0	ND	NS	Fixed
	9/7/2004	ND	ND	ND	ND	ND	ND	NS	Fixed
	12/20/2004	ND	ND	ND	ND	ND	ND	NS	Fixed
	3/10/2005	ND	ND	ND	ND	ND	ND	NS	Fixed
	6/9/2005	ND	ND	ND	ND	ND	ND	NS	Fixed
	8/4/2005	ND	ND	ND	ND	ND	ND	NS	Fixed
	11/9/2005	ND	ND	ND	ND	ND	ND	NS	Fixed
	3/1/2006	<1.0	<5.0	<1.0	<3.0	NS	<100	NS	Fixed
	7/13/2006	<0.5	<5.0	<0.5	<1.0	<10.0	<100	140	Fixed
	10/4/2006	<0.5	<5.0	<0.5	<1.0	<10.0	<100	190	Fixed
	3/9/2007	<0.5	<5.0	<0.5	<1.0	<10.0	<100	170	Fixed

Table 11
Analytical Results of Water Samples Collected from Wells[1]

Well Number	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	GRO	DRO	Lab Type[2]
	7/24/2007	<0.5	<5.0	<0.5	<1.0	<10.0	<100	NS	Fixed
	1/20/2010	<1.0	<1.0	<1.0	<3.0	<5.0	<100	170	Fixed
	1/12/2011	<1.0	<1.0	<1.0	<3.0	<5.0	<100	126	Fixed
	3/23/2011	<1.0	<1.0	<1.0	<3.0	<5.0	<100	125	Fixed
	6/8/2011	<1.0	<1.0	<1.0	<3.0	<5.0	<100	312	Fixed
	10/4/2011	<1.0	<1.0	<1.0	<3.0	<5.0	<100	146	Fixed
	01/10/2013	<1.0	<1.0	<1.0	<3.0	<1.0	<100	124	Fixed
	05/3/2013	<1.0	<1.0	<1.0	<3.0	<1.0	<100	123	Fixed
	08/01/2014	**<1.0**	**<1.0**	**<1.0**	**<3.0**	**NS**	**<50.0**	**<120**	**fixed**
	08/13/2015	**<1.0**	**<1.0**	**<1.0**	**<3.0**	**NA***	**<100**	**130**	**fixed**
MW-7	11/9/2005	3900	8600	1200	7800	ND	37000	NS	Fixed
	3/1/2006	5,200	<12,000	<2,500	8,200	<2,500	42,000	NS	Fixed
	7/13/2006	2,200	6,000	1,400	7,700	<1.0	NS	6,900	Fixed
	10/4/2006	3,300	6,000	1,900	8,300	<50	NS	9,100	Fixed
	3/9/2007	3,900	7,300	1,500	7,000	<10	43,000	10,000	Fixed
	7/24/2007	3,700	7,600	1,700	8,600	1,300	<100,000	8,600	Fixed
	10/4/2011	4,540	8,050	1,910	10,200	572	10200	14,200	Fixed
	01/10/2013	NS	NS	NS	NS	NS	NS	NS	Fixed
	05/3/2013	NS	NS	NS	NS	NS	NS	NS	Fixed
	2/3/2014	**NS**	**Product**						
	5/2/2014	**NS**	**Product**						
	08/01/2014	**NS**	**Product**						
	11/07/2014	**NS**	**Product**						
	02/09/2015	**NS**	**Product**						
	05/08/2015	**2440**	**5760**	**1360**	**7610**	**NA***	**28100**	**11100**	**fixed**
	08/13/2015	**3600**	**7650**	**1830**	**10100**	**NA***	**37000**	**10700**	**fixed**
	11/03/2015	**3140**	**7140**	**1530**	**8450**	**NA***	**35900**	**19200**	**fixed**
	02/02/2016	**2850**	**5410**	**1450**	**8550**	**NA***	**37900**	**19400**	**fixed**
MW-8	01/10/2013	*2,590*	4,670	1,490	6,840	<20	*26,200*	*27,800*	Fixed
	05/3/2013	NS	NS	NS	NS	NS	NS	NS	Fixed
	2/3/14	**NS**	**Buried under snow bank, construction equipment**						
	5/2/2014	**NS**	**Product**						
	08/01/2014	**NS**	**Product**						
	11/07/2014	**NS**	**Product**						
	02/09/2015	**NS**	**Product**						
	05/08/2015	**148**	**243**	**61.4**	**251**	**NA***	**12900**	**13100**	**fixed**
	08/13/2015	**843**	**1610**	**398**	**1830**	**NA***	**12300**	**11200**	**fixed**
	11/03/2015	**1020**	**1680**	**335**	**1900**	**NA***	**15100**	**12400**	**fixed**

Table 11
Analytical Results of Water Samples Collected from Wells[1]

Well Number	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	GRO	DRO	Lab Type[2]
	02/02/2016	**1360**	**2100**	**526**	**2880**	**NA***	**21400**	**8500**	**fixed**
DUP-1 (MW-8)	**02/02/2016**	**1370**	**2020**	**476**	**2550**	**NA***	**15900**	**10300**	**fixed**
MW-9	01/10/2013	*6,690*	7,210	1,840	8,950	<20	*30,500*	*16,000*	Fixed
	05/3/2013	*7,110*	7,330	1,950	9,140	<25	*47,000*	*787*	Fixed
	2/3/2014	**3,950**	**6,030**	**1,460**	**6,860**	**NS**	**35,600**	**6,200**	**Fixed**
	05/02/2014	**3610**	**4650**	**1520**	**7530**	**NS**	**30700**	**6500**	**fixed**
DUP-1 (MW-9)	**05/02/2014**	**4460**	**5590**	**1650**	**7970**	**NS**	**34800**	**5900**	**fixed**
	08/01/2014	**3720**	**6390**	**1730**	**8430**	**NS**	**30400**	**6400**	**fixed**
	11/07/2014	**4550**	**4670**	**1430**	**7060**	**NS**	**28900**	**9100**	**fixed**
DUP-1 (MW-9)	**11/07/2014**	**5570**	**5450**	**1590**	**7780**	**NS**	**34500**	**9700**	**fixed**
	02/09/2015	**3590**	**3520**	**1090**	**5020**	**NA***	**27400**	**9800**	**fixed**
DUP-1 (MW-9)	**02/09/2015**	**4570**	**4570**	**1420**	**6590**	**NA***	**29500**	**9800**	**fixed**
	05/08/2015	**1900**	**2300**	**1130**	**7270**	**NA***	**20600**	**7600**	**fixed**
DUP-1 (MW-9)	**05/08/2015**	**2090**	**2470**	**1140**	**7350**	**NA***	**23600**	**9600**	**fixed**
	08/13/2015	**2700**	**3880**	**1190**	**7270**	**NA***	**27900**	**7500**	**fixed**
	11/03/2015	**5470**	**5160**	**1620**	**8010**	**NA***	**33700**	**10600**	**fixed**
	02/02/2016	**4100**	**3760**	**1070**	**5720**	**NA***	**27700**	**10300**	**fixed**
MW-10	01/10/2013	*375*	207	551	2,750	<10	*12,500*	*14,700*	Fixed
	05/3/2013	*327*	431	427	2,080	<100	*17,700*	*8,960*	Fixed
	2/3/2014	**249**	**313**	**364**	**1,730**	**NS**	**12,000**	**7,500**	**Fixed**
	05/02/2014	**266**	**357**	**377**	**1670**	**NS**	**10700**	**4700**	**fixed**
	08/01/2014	**291**	**480**	**535**	**2350**	**NS**	**10600**	**4300**	**fixed**
	11/07/2014	**104**	**153**	**271**	**1230**	**NS**	**6090**	**3300**	**fixed**
	02/09/2015	**196**	**172**	**243**	**1120**	**NA***	**7920**	**3100**	**fixed**
	05/08/2015	**212**	**229**	**246**	**1030**	**NA***	**7580**	**4400**	**fixed**
	08/13/2015	**229**	**238**	**366**	**1620**	**NA***	**8140**	**3400**	**fixed**
	11/03/2015	**279**	**182**	**342**	**1320**	**NA***	**7590**	**3400**	**fixed**
	02/02/2016	**277**	**291**	**363**	**1270**	**NA***	**8060**	**4400**	**fixed**
MW-11	01/10/2013	<1.0	<1.0	<1.0	<3.0	<1.0	<100	<105	Fixed
	05/3/2013	<1.0	<1.0	<1.0	<3.0	<1.0	<100	<104	Fixed
	05/02/2014	**<1.0**	**<1.0**	**<1.0**	**<3.0**	NS	**<100**	**<110**	**fixed**
	11/07/2014	**<1.0**	**1.6**	**<5.0**	**<12.0**	NS	**253**	**<120**	**fixed**
	05/08/2015	**<1.0**	**<1.0**	**<1.0**	**4.4**	**NA***	**<100**	**<120**	**fixed**

Table 11
Analytical Results of Water Samples Collected from Wells[1]

Well Number	Date Sampled	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	GRO	DRO	Lab Type[2]
	11/03/2015	**<1.0**	**<2.5**	**<2.5**	**<3.0**	**NA***	**<100**	**<110**	**fixed**
Lab Blank	1/11/2002	ND	ND	ND	ND	NS	ND	NA	Fixed
	6/24/2002	ND	ND	ND	ND	NS	ND	NA	Fixed
	9/13/2002	ND	ND	ND	ND	NS	ND	NA	Fixed
	12/26/2002	ND	ND	ND	ND	NS	ND	NA	Fixed
	4/14/2003	ND	ND	ND	ND	NS	ND	NA	Fixed
	7/7/2003	ND	ND	ND	ND	NS	ND	NA	Fixed
	10/10/2003	ND	ND	ND	ND	NS	ND	NA	Fixed
	2/6/2004	ND	ND	ND	ND	NS	ND	NA	Fixed
	3/18/2004	ND	ND	ND	ND	NS	ND	NA	Fixed
	9/7/2004	ND	ND	ND	ND	NS	ND	NA	Fixed
	12/20/2004	ND	ND	ND	ND	NS	ND	NA	Fixed
	3/10/2005	ND	ND	ND	ND	NS	ND	NA	Fixed
	6/9/2005	ND	ND	ND	ND	NS	ND	NA	Fixed
	8/4/2005	ND	ND	ND	ND	NS	ND	NA	Fixed
	11/9/2005	ND	ND	ND	ND	NS	ND	NA	Fixed
	3/1/2006	ND	ND	ND	ND	NS	ND	NA	Fixed
	7/13/2006	ND	ND	ND	ND	ND	ND	NA	Fixed
	10/4/2006	ND	ND	ND	ND	ND	ND	NA	Fixed
	1/12/2011	ND	ND	ND	ND	ND	ND	NA	Fixed
	3/23/2011	ND	ND	ND	ND	ND	ND	NA	Fixed
	6/8/2011	ND	ND	ND	ND	ND	ND	NA	Fixed
	10/4/2011	ND	ND	ND	ND	ND	ND	NA	Fixed
	01/10/2013	ND	ND	ND	ND	ND	ND	NA	Fixed
	05/3/2013	ND	ND	ND	ND	ND	ND	NA	Fixed
	2/3/2014	Lab blank froze							
05/02/2014	<1.0			<1.0	<1.0	<3.0	NS	NS	NS
	08/01/2014	<1.0	<1.0	<1.0	<3.0	NS	<50.0	NS	fixed
	11/07/2014	<1.0	<1.0	<5.0	<12.0	NS	<100	NS	fixed
	08/13/2015	<1.0	<1.0	<1.0	<3.0	NS	<100	NS	fixed
	11/03/2015	<1.0	<2.5	<2.5	<3.0	NS	<100	NS	fixed
	02/02/2016	<1.0	<1.0	<1.0	<3.0	NS	<100	NS	fixed
HRL(ug/L)		2	200	50	300	70	NL	NL	

[1] Report results in µg/L. Use less than symbols to show detection limit.

[2] Indicate “mobile” or “fixed” in the lab type column.
[3] See http://www.health.state.mn.us/divs/eh/groundwater/hrltable.html for list of current HRLs.
Add additional rows as needed.
Notes:
NS = not sampled
ND= Not detected above laboratory reporting limits

Table 12
Other VOCs

Well Number	MW-8	MW-9	MW-9	MW-10	HRL	**Lab Type[2]**
Date Sampled	1/10/13	1/10/13	5/3/13	1/10/13		
Acetone	523	<500	<500	<250	4,000	Fixed
n-Butylbenzene	43.7	60.9	<25	40.3	NE	Fixed
Sec-Butylbenzene	22.8	31.7	<25	24.3	NE	Fixed
Cyclohexane	881	600	NA	1,030	NE	Fixed
1,2-Dichloroethane	<20	53.7	74.6	<10	4	Fixed
Cumene	115	122	81.1	119	300	Fixed
p-Isopropyltoluene	28.6	37.9	<25	40.5	NE	Fixed
Naphthalene	438	550	428	274	300	Fixed
n-Propylbenzene	234	315	193	225	NE	Fixed
1,2,4-Trimethylbenzene	1,540	2,080	1,270	1,890	100	Fixed
1,3,5-Trimethylbenzene	401	523	320	557	100	Fixed
Trip Blank						
Equip. Blank						
Lab Blank						

[1] Report results in µg/L. Use less than symbols to show detection limit.
[2] Indicate "mobile" or "fixed" in the lab type column.
[3] See http://www.health.state.mn.us/divs/eh/groundwater/hrltable.html for list of current HRLs.
Indicate other contaminants (either petroleum or non-petroleum derived) detected in water samples collected from wells.
Add additional rows as needed, and copy the entire table if more columns are needed.
Notes: NA = Not Analyzed; NE = Not Established

~~Table 13~~
~~Natural Attenuation Parameters~~

Well Number	Sample Date	Temp. °C	pH	Dissolved Oxygen (mg/L)	Nitrate (mg/L)	(Fe II) (mg/L)	(H_2S, HS^-) (mg/L)
MW-1							
MW-2							
MW-3							
MW-4							

Describe the methods and procedures used in Section 6. Add additional rows as needed
Notes:

Table 14
Free Product Recovery

Recovery Location ID	Recovery Date	Pre-Recovery Measurements				Recovery Method	Event Recovery[3]		Cumulative Recovery[4]		Comments
		Depth to FP[1] (ft)	Depth to GW[2] (ft)	FP Thickness (ft)	FP Volume (gal)		FP (gal)	GW (gal)	FP (gal)	GW (gal)	
MW-3	2/3/14	**17.52**	**18.04**	**.52'**	.08	No recovery required at this time	0	0	0	0	
	3/6/14	**17.59**	**18.12**	**.53'**	.08		0	0	0	0	
MW-7	2/3/14	**18.28**	**18.30**	**0.02'**	.004		0	0	0	0	
	3/6/14	**18.32**	**18.35**	**0.03'**	.004		0	0	0	0	
MW-9	2/3/14	**NA**	**18.46**	**NA**	0		0	0	0	0	
	3/6/14	**NA**	**18.46**	**NA**	0		0	0	0	0	
MW-8	2/3/14	NS					0	0	0	0	Not accessible, covered by snow/soil pile
	3/6/14	NS					0	0	0	0	Not accessible, covered by snow/soil pile

[1] FP = Free Product
[2] GW = Ground Water
[3] Volume recovered during individual recovery event for that location.
[4] Cumulative volume recovered at each recovery location (i.e., keep a running total for each recovery point).
Describe the methods and procedures used in Section 6. Add additional rows as needed.
Notes:
NA – Not applicable – no product
NS – not sampled

~~Table 15~~
~~Properties Located within 500 feet of the Release Source~~

Prop ID[1]	Property Address	Distance From Site (ft)	Water Supply Well			Public Water Supply		Base-ment (Y/N)	Sump (Y/N)	Possible Petroleum Sources (Y/N)	Comments (including property use)
			Well Present (Y/N)	How Determined[2]	Well Use[3]	Utilized (Y/N)	Confirmed by City (Y/N)				
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

[1] Property IDs should correspond to labeled properties in the Potential Receptor Map.
[2] For example, visual observation, personal contact, telephone, returned postcard, assumed (i.e., no postcard returned).
[3] For example, domestic, industrial, municipal, livestock, lawn/gardening, irrigation.
Add additional rows as needed.
Notes:

~~Table 16~~
~~Water Supply Wells Located within 500 feet of the Release Source and Municipal or Industrial Wells within ½ mile~~

Property ID[1]	MDH Unique Well Number	Ground Elevation	Total Depth (ft)	Base of Casing (ft)	Static Elevation	Aquifer	Use	Owner	Distance and Direction from Source (ft)

[1] Property IDs should correspond to properties listed in Table 15 and labeled properties in the Potential Receptor Map if known or applicable.

Add additional rows as needed.

Notes:

~~Table 17~~
~~Surface Water Receptor Information~~

Map ID[1]	Name and Type[2]	Distance and Direction from Plume Edge (ft)	Clean Boring/Well Between?[3] (Y or N)

[1] Map ID should correspond to a surface water feature ID on the Potential Receptor Map.
[2] Type includes, but is not limited to, lake, retention pond, infiltration pond, ditch, intermittent stream, river, creek, rain garden, etc.
[3] If the surface water feature is upgradient or cross-gradient from the site, indicate so with "NA" for not applicable.
Add additional rows as needed.
Notes:

Table 18
Utility Receptor Information

Utility ID[1]	Description	Construction Material	Depth to Top of Structure	Diameter	Flow Direction (for liquids)	Year Installed	Backfill Material	Distance to Water Table
1	*Sanitary sewer main beneath S. Buchanan Street between 1st Ave. E. and 2nd Ave SE*	*PVC*	*10'*	*21 inches*	*South*	*2001-2002*	*Native soil*	*8'*
2	*Water main beneath S. Buchanan Street between 1st Ave. E. and 2nd Ave SE*	*Ductile Iron*	*7-8'*	*16 inches*	*North*	*2001-2002*	*Native soil*	*10'*
3	*Storm sewer beneath S. Buchanan Street between 1st Ave. E. and 2nd Ave SE*	*Concrete*	*4.5-5' ft*	*21 inches*	*South*	*unknown*	*Native soil*	*13'*
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

[1] ID should correspond to an identified utility line on the Potential Receptor Map.
Add more rows as needed.
Notes:

Utility ID[1]	Name, title, and telephone number for public entity contacted to obtain information or other source of information
1, 2, 3	As built drawings provided by utility locator with City of Cambridge.

[1] IDs should correspond to the same IDs in the above table.
Add more rows as needed.
Notes:

Table 19
Vapor Survey Results

Location ID[1]	Description[2]	Monitoring Date	PID Reading (ppm)	Percent of the LEL[3]
1	Storm Sewer catch basin	3/23/11	0	0
2	Storm Sewer manhole	3/23/11	0	0
3	Storm Sewer catch basin	3/23/11	0	0
4	Storm Sewer manhole	3/23/11	0	0
5	Storm Sewer catch basin	3/23/11	0	0
6	Storm Sewer catch basin	3/23/11	0	0
7	Storm Sewer catch basin	3/23/11	0	0
8	Storm Sewer manhole	3/23/11	0	0
9	Legion basement ambient	3/23/11	0	0

[1] Location IDs must match labeled locations on the Vapor Survey Map.
[2] Provide a brief description of the monitoring point (e.g., sump, basement corner, sanitary sewer manhole, storm sewer basin, etc.).
[3] LEL = Lower Explosive Limit.
Add additional rows as needed.
Notes:

Table 20
Results of Soil Gas Sampling for Vapor Intrusion Screening[1]

Sample ID[2]	Vapor Pt 1		Vapor Pt 2		Vapor Pt 3		Subslab-1				Residential Intrusion Screening Value[3]
Date	1/21/2010		1/21/2010		1/21/2010		3/22/2011				
Depth (feet)											
PID (ppm)											
COMPOUNDS	Result	Report Limit	Result	Report Limit	Result	Report Limit	Result	Report Limit	Result	Report Limit	
Acetone	<0.64	0.64	83.6	0.64	<0.64	0.64	64.4	0.86			31,000
Benzene	<0.87	0.87	84.6	0.87	<0.87	0.87	1.5	1.2			4.5
2-Butanone (MEK)							5.1	1.1			5000
1,3-Butadiene	<0.6	0.6	64.5	0.6	<0.6	0.6	<0.81	0.81			0.3
Carbon Disulfide	<0.84	0.84	3.7	0.84	<0.84	0.84	<1.1	1.1			700
Chloroform							10.2	1.8			100
Cyclohexane	<0.91	0.91	12.8	0.91	<0.91	0.91	3.2	1.2			6,000
Dichlorodifluoromethane							14.5	1.8			200
Ethanol	<2.5	2.5	15.0	2.5	<2.5	2.5	341	3.4			15,000
Ethylbenzene	<1.2	1.2	42.1	1.2	<1.2	1.2	5.7	1.6			1,000
4-Ethyltoluene	<3.4	3.4	7.4	3.4	<3.4	3.4	<4.5	4.5			NA
n-Heptane	<1.1	1.1	78	1.1	<0.96	0.96	4.5	1.5			NA
n-Hexane							12.2	1.3			2000
Methylene Chloride							13.8	1.3			20
2-Propanol							18.1	4.5			7000
Propylene							2.7	0.63			3000
Styrene	<1.2	1.2	44.7	1.2	<1.2	1.2	<1.6	1.6			1,000
Tolunene	<1.0	1.0	132	1.0	<1.0	1.0	22	1.4			5,000
1,2,4-Trimethylbenzene	<1.3	1.3	9.3	3.4	<3.4	3.4	<1.8	1.8			4
M&p-Xylene	<2.4	2.4	88.9	2.4	<2.4	2.4	24.8	3.2			100
o-Xylene	<1.2	1.2	27	1.2	<1.2	1.2	5.1	1.6			100

[1] Report results in µg/m^3.
[2] Sample IDs should correspond to labeled locations on the Vapor Intrusion Assessment Map.
[3] The Intrusion Screening Values can be found in Guidance Document 4-01a *Vapor Intrusion Assessments Performed during Site Investigations*.
Add additional rows as needed, and copy the entire table if more columns are needed.
Notes:

Section 6: Appendices

Attach all required or applicable appendices in the following order. Indicate those appendices that are included in this report by marking the check box. The appendix section of the report contains sufficient information to document all activities completed since the last report. All reproduced data must be legible. Reports missing required documentation are subject to rejection.

☒	*Appendix A*	Copies of most recent laboratory analytical reports for Soil, Soil Gas/Sub-slab Vapor/Indoor Air/Ambient Air, and Ground Water samples, including a copy of the Chain of Custody. Include laboratory QA/QC data, Chromatograms, and MDH laboratory certification number.
☒	*Appendix B*	Methodologies and Procedures, Including Field Screening of Soil, Other Field Analyses, Soil Boring, Soil Sampling, Soil Gas/Sub-Slab/Indoor air/Ambient Air Sampling, Well Installation, and Water Sampling.
☐	*Appendix C*	Geologic Logs of Additional Soil Borings and Wells Installed. Include Well Construction Diagrams and Copies of the Minnesota Department of Health Well Record for new wells.
☒	*Appendix D*	Field or sampling data sheets (sampling forms, field crew notes, etc.).
☐	*Appendix E*	Guidance Document 1-03a *Spatial Data Reporting Form* (if not previously submitted or new site features need to be reported).
☐	*Appendix F*	Guidance Document 2-05 *Release Information Worksheet* (if not previously submitted).
☐	*Appendix G*	Guidance Document 4-19 *Conceptual Corrective Action Design Worksheet.*

Web pages and phone numbers	
MPCA staff	http://www.pca.state.mn.us/pca/staff/index.cfm
MPCA toll free	**1-800-657-3864**
Petroleum Remediation Program web page	http://www.pca.state.mn.us/programs/lust_p.html
MPCA Info. Request	http://www.pca.state.mn.us/about/inforequest.html
MPCA VIC program	http://www.pca.state.mn.us/cleanup/vic.html
MPCA Petroleum Brownfields Program	http://www.pca.state.mn.us/programs/vpic_p.html
MPCA SRS guidance documents	http://www.pca.state.mn.us/cleanup/riskbasedoc.html http://www.pca.state.mn.us/cleanup/riskbasedoc.html#surfacewaterpathway
MDH HRLs	http://www.health.state.mn.us/divs/eh/groundwater/hrltable.html
MDH DW hotline	**1-800-818-9318**
Petrofund Web Page	http://www.state.mn.us/cgi-bin/portal/mn/jsp/content.do?id=-536881377&agency=Commerce
Petrofund Phone	**651-215-1775 or 1-800-638-0418**
State Duty Officer	**651-649-5451 or 1-800-422-0798**

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Appendix I

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